

# Power Management Connectivity & Monitoring

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#### Specifications

See Eaton's *Product Specification Guide*, available on CD or on the Web.

CSI Format .....	1995	2010
	<b>Section 16901 &amp; Section 16911</b>	<b>Section 26 27 13.11 &amp; Section 26 09 13.13</b>
Addressable Relay II. ....	<b>Section 16902, Paragraph 2.02.C</b>	<b>Section 26 29 05, Paragraph 2.02.C</b>
BIMII .....	<b>Section 16901, Paragraph 2.04.A</b>	<b>Section 26 27 13.11 &amp; Paragraph 2.04.A</b>
SMLD .....	<b>Section 16901, Paragraph 2.04</b>	<b>Section 26 27 13.11 &amp; Paragraph 2.04</b>



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## Power Xpert Architecture Introduction

### Enabling Power System Management

Eaton's Power Xpert Architecture (PXA) provides a complete hardware/software solution to manage your entire power system. Power Xpert Architecture consists of Power Xpert meters, gateways, switches and software.

Power Xpert devices are devices that can provide by themselves, or facilitate for others, Ethernet network protocols to communicate with your critical infrastructure components. Power Xpert devices provide the intelligent hardware connectivity layer to allow Web-enabled communications throughout the power system.

### Power Xpert Meters

Power Xpert Meters provide measurement of the critical elements found in power systems, including voltage, power, current, transients, harmonics or even time. Power Xpert Meters provide Web-enabled communications for use through a Web browser or with the Power Xpert Software or third-party monitoring systems.

### Power Xpert Gateways

Power Xpert Gateways are capable of Web-enabling electrical devices contained in electrical gear via a standard Web-browser on the Ethernet network. Standard on-board Web pages eliminate the need for any customer programming or software.

### Power Xpert Gateway (X-Slot) Cards

Eaton's Power Xpert Gateway Cards (PXGX) for the UPS and PDP provide Web-enabled, real-time monitoring of your important infrastructure equipment, including single- and three-phase Eaton UPSs and Eaton Power Distribution Units, Eaton Remote Power Panels, Rack Power Modules, and the Eaton Energy Management System for power quality status and fast response to power-related events.

## Power Xpert Ethernet Switches

Eaton's Power Xpert Ethernet switches are ideal for extending Ethernet networks in harsh, industrial environments. Power Xpert Ethernet switches provide communications from the factory floor or facility basement to the front end office.

### Power Xpert Software

Power Xpert Software is a comprehensive solution for system-level management of your power infrastructure via a Web-browser. Power Xpert Software provides a clear picture of what is happening at a component, device and system level. Because no two organization's needs are the same, Power Xpert Software is available in two editions.

#### Power Xpert Software Professional Edition

Geared toward end users, with built-in support for Eaton power distribution products such as switchgear, UPSs, breakers, PDUs, RPPs, meters, relays, VFDs and MCCs among others. Eaton products connect with the software directly via an Ethernet connection, while legacy devices use a Power Xpert Gateway to Web enable their communications. A subset of third-party meters and devices are supported as standard via the gateway connection.

#### Power Xpert Software Enterprise Edition

Geared toward advanced power users, system integrators and enterprises with heterogeneous device spectrum and system developers who can take advantage of the included SNMP and Modbus integration development utilities.

- Extensive support for third-party devices via standard SNMP and Modbus TCP protocols
- Large variety of ready-made third-party drop-in drivers

## Foreseer Services

Foreseer Software and Engineering Services provide the vendor with independent, power and energy infrastructure integration solutions that help companies reduce energy consumption and unplanned downtime due to the failure of critical power, environmental, safety or security systems.

### Power Xpert Reporting

Eaton's Power Xpert Reporting works in conjunction with Power Xpert Software or Foreseer Services, allowing a view past individual measurements, trend graphs and events. It consolidates complex data from a multitude of devices from around the globe into easy-to-understand graphical reports.

### Support for Existing PowerNet Systems

Power Xpert Software is directly compatible with existing PowerNet systems v.3.32 and higher. All communications hardware devices such as MINT II can be connected to Power Xpert Software through the PowerNet server for configuration of the INCOM™ communication devices.

## Power Xpert Architecture

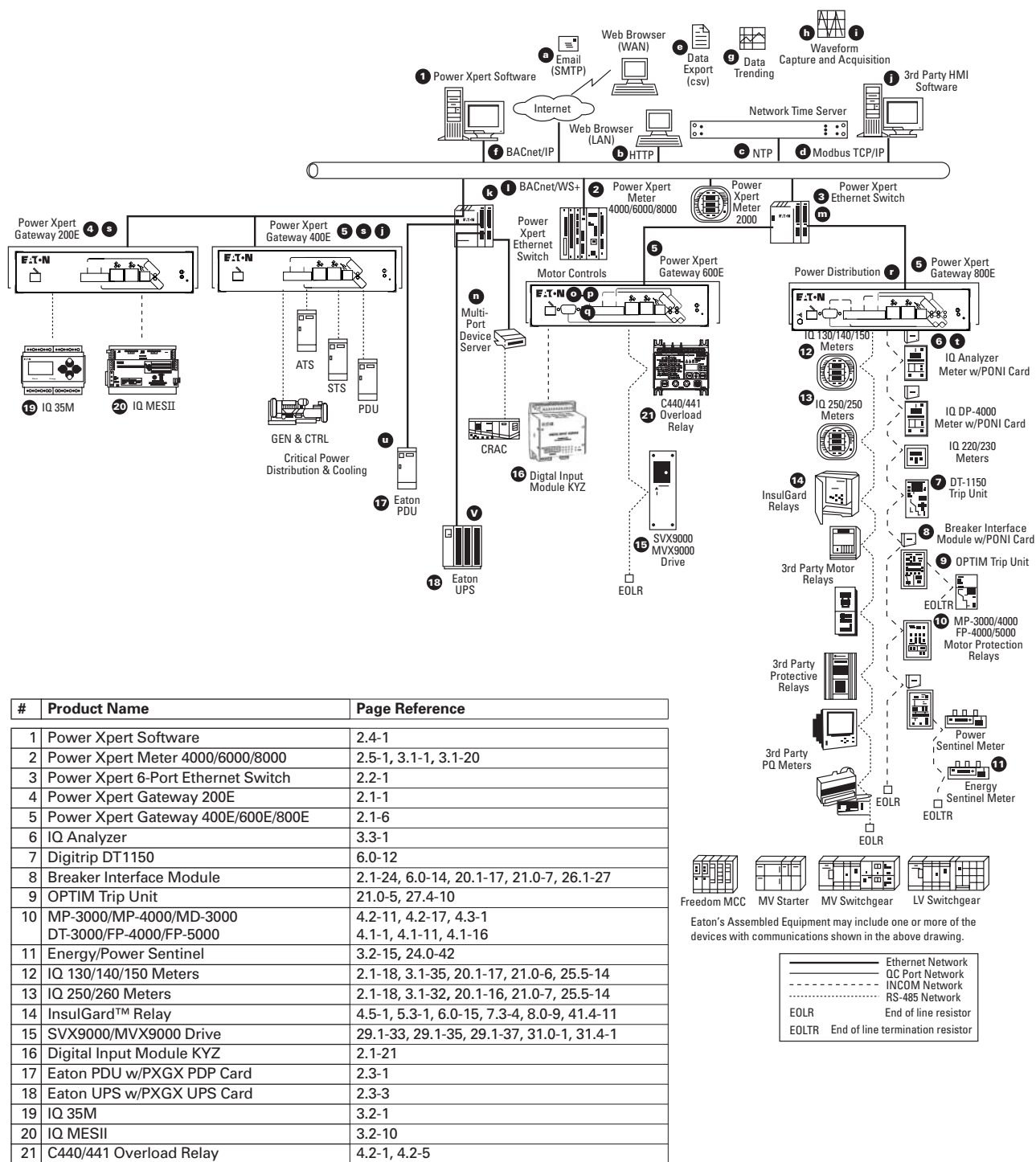


Figure 2.0-1. Power Xpert System Overview

See Notes on Page 2.0-4.

## Power Xpert System—Notes

- a. Simple Mail Transfer Protocol (SMTP)—Device events and periodic log file attachments are sent to users in the form of an email from the following Power Xpert products: Foreseer Services, Power Xpert Software, Power Xpert Meters 2000/4000/6000/8000, Power Xpert Gateway 600E, 800E and Power Xpert Gateway UPS and PDP Cards.
- b. Hyper Text Transfer Protocol (HTTP)—Web browser access is available on the following Power Xpert products: Foreseer Services, Power Xpert Software, Power Xpert Meters 4000/6000/8000, Power Xpert Gateways and Power Xpert Gateway UPS and PDP Cards.
- Hyper Text Transfer Protocol Secure (HTTPS)—A secure protocol allowing Web browser access on the following Power Xpert products: Power Xpert Software, Power Xpert Meters 2000/4000/6000/8000, Power Xpert Gateways and Power Xpert Gateway Cards.
- c. Network Time Server (NTP)—Network Time Protocol (Client-side) is available on the following Power Xpert products: Foreseer Services, Power Xpert Software, Power Xpert Meters 2000/4000/6000/8000, Power Xpert Gateways and Power Xpert Gateway UPS and PDP Cards.
- d. Modbus TCP/IP—Modbus TCP/IP over Ethernet is available on the following Power Xpert products: Foreseer Services, Power Xpert Software, Power Xpert Meters 2000/4000/6000/8000, Power Xpert Gateways and Power Xpert Gateway UPS and PDP Cards. Modbus register maps are available online at [www.eaton.com/powerxpert](http://www.eaton.com/powerxpert).
- e. Data Export—Data files consist of metered data and event log information that is exported from the meter, gateway or software in the form of a .csv (comma separated variable) file. Supported products are: Power Xpert Gateway PXG 600E/800E, PXGXUPS, PXGXDP, Power Xpert Meter 2000/4000/6000/8000 and Power Xpert Software.

- f. BACnet/IP—Over Ethernet is available on the following Power Xpert products: Power Xpert Gateways (200E/400E/600E/800E) and Power Xpert Gateway Cards (UPS, PDP).
- g. Data Trending—Viewing trended data in a standard web browser interface in the form of a graphed line for one or more data points is available for the following products: Power Xpert Gateway 600E/800E, PXGXUPS, PXGXDP, Power Xpert Meter 2000/4000/6000/8000 and Power Xpert Software.
- h. Waveform Capture—The ability to capture a waveform and/or export the waveform as a standard comtrade file format is available on the following products: Power Xpert Meter 4000/6000/8000.
- i. Waveform Acquisition and Export—The ability to acquire a waveform from another device that natively captures a waveform internally and then export that waveform in a standard comtrade file format is supported by the following devices: PXG 600E/800E (provides data acquisition and comtrade conversion for: IQ Analyzer, DT1150 and FP-5000).
- Note:** The Power Xpert Meters 4000/6000/8000 also export natively captured waveforms as comtrade file format.
- j. Third-Party HMI Software Integration—Is achieved through the Modbus TCP/IP interface on all Power Xpert devices. If PowerNet software is used in the system, then an OPC server is available.
- k. Proprietary Serial Device Protocols over Ethernet—The ability to communicate with third-party equipment is achieved by first converting the physical serial media to Ethernet by using a standard serial to Ethernet multiport terminal server (see Note k.). Next, a device driver library is required to convert the proprietary protocol to an Eaton internal standard to allow the data to be integrated within Eaton software. Products that support this type of third-party device integration are Foreseer Services.

- l. BACnet/WS+—Is based upon the protocol specification developed by the ASHRAE standards group as an Addendum c to Standard 135-2004.

Reference: [BACnet—A Data Communication Protocol for Building Automation and Control Networks. Public Review Draft, ASHRAE Standard. BSR/ASHRAE Addendum c to ANSI/ASHRAE Standard 135-2004. First Public Review. Released: October 22, 2004. 32 pages. Copyright (c) American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. August 30, 2004.]

This draft shows proposed changes to the current BACnet standard.

**Note:** Eaton Corporation has extended this protocol addendum with a (+) to signify the addition of an “event-driven” behavior to the existing “polled” data acquisition model. This allows optimization in communications between Power Xpert devices and Power Xpert Software.

- m. Power Xpert Ethernet Switch—The Eaton Power Xpert Ethernet switch provides connectivity between Power Xpert devices on a common subnetwork. The 6-port version of the switch shown provides six RJ-45 network ports. As an option 1 or 2 of these ports can be substituted to be ST-Type fiber connections.
- n. Multiport Terminal Server—Is a device that is used to add network connectivity to serial devices. These terminal servers offer 8 or 16 RS-232/485 serial ports to connect a variety of serial devices including meter devices, UPS, PDU, static switch, automatic transfer switch, generators, computer room air conditioners, and other commercial, industrial or business automation equipment. The serial ports use standard RJ-45 or DB-9 connectors for convenient cabling, and optional adapters are available as well.

- o. Single-port Device Server—Is a device that is used to add network connectivity to a single serial device. These device servers offer a single RS-232/485 serial port to connect a variety of serial devices including meter devices, UPS, PDU, static switch, automatic transfer switch, generators, computer room air conditioners, and other commercial, industrial or business automation equipment. The serial ports use standard RJ-45 or DB-9 connectors for convenient cabling, and optional adapters are available as well.
- p. PXG 600E/800E COM2 Port—Is used to communicate on a Modbus RS-232/485 network or on an Eaton QCPort (IT) bus. The user may choose between a DB-9 or terminal strip connector to connect up to 32, RS-45 serial devices.
- q. PXG 600E/800E COM1 Port—Is used to communicate on a Modbus RS-232/485 network or on an Eaton QCPort (IT) bus. A terminal strip connector is provided for this interface. Up to 32 devices may be connected to this port.
- r. PXG 600E/800E INCOM Port—Is used to communicate on an Eaton INCOM device network only. Up to 64 devices may be connected to this port.
- s. PXG 200E/400E Ports—The ports on the PXG 200E/400E operate the same as on the PXG 600A; however, there is only one RS-232/485 port to be used for Modbus or QCPort.
- t. PONI (Product Oriented Network Interface)—Is used to connect the Breaker Interface Module (8) to an INCOM network.
- u. PXGXPDP Card—Is used to connect an Eaton PDU (Power Distribution Unit) or RPP (Remote Power Panel) to an Ethernet network. Available interfaces are: HTTP (Web) SNMP, SMTP (e-mail), Modbus TCP/IP, BACnet/IP and BACnet/WS+.
- v. PXGXUPS Card—Is used to connect an Eaton UPS to an Ethernet network. Available interfaces are: HTTP (Web) SNMP, SMTP (e-mail), Modbus TCP/IP, BACnet/IP and BACnet/WS+.

**Important Note:** When connecting multiple Modbus RTU devices to either a multiport terminal server or a Power Xpert Gateway over an RS-485 daisy-chain network, the baud rate, data frame (stop bits, data bits and parity), byte order (standard or reversed) and physical wiring (two- or four-wire) must be the same for all devices connected.

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## Power Xpert Gateway 200E

## Power Xpert Gateway 200E



Power Xpert Gateway 200E

## General Description

The Power Xpert Gateway 200E (PXG 200E) is designed to provide a Web-enabled gateway to serially communicating energy meters via a standard Web browser. The PXG 200E supports revenue grade single and multipoint energy meters via Modbus RTU and INCOM. Operates as a cost-effective hardware solution for better energy management; no software required; can export data for use in other new or existing monitoring systems.

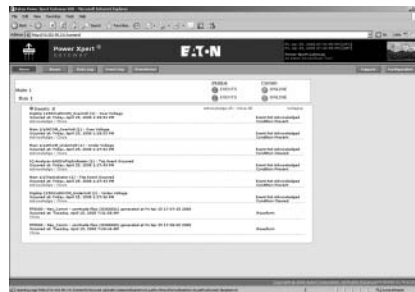
The PXG 200E allows you to:

- Monitor energy usage patterns and reveal opportunities for efficiency improvements
- Remotely monitor real-time conditions and profile 5-minute interval trend logs, and export data in csv format
- Allocate energy costs to departments or processes
- Reduce peak demand surcharges
- Reduce power factor penalties
- Identify billing discrepancies
- Allows user to daisy-chain multiple Ethernet compatible downstream devices via RJ-45 port (for specifics, see **Page 2.1-5, Figure 2.1-5**)
- Connect to downstream devices via a Web browser, Modbus master or SNMP client separately or concurrently

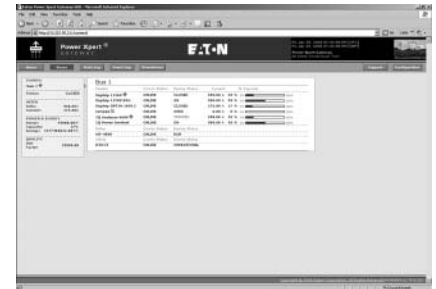
Fixed List of supported devices (no ability to add new product support via EDS upload); however, new supported devices will be added during firmware updates.

- IQ 35M
- IQ Energy Sentinel
- IQ 130
- IQ 140
- IQ 150
- IQ 220/230
- IQ 220M/230M
- IQ 250
- IQ 260
- IQ MESII
- DIM KYZ (WAGES)
- EI NEXUS 1200 Series
- PM710

## Power Xpert Gateway Screenshots



Home Page



Bus Page



Device Page

### Power Xpert Gateway 200E

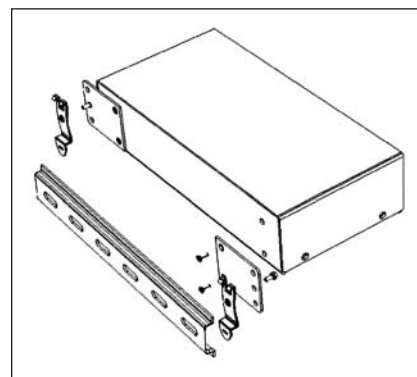
**Table 2.1-1. PXG 200E Features**

Features	PXG 200E
Total number of supported devices	64
Maximum number of INCOM devices supported	64
Maximum number of Modbus devices supported	32
Protocols supported on downstream devices: (INCOM and Modbus RTU)	Yes
Number of downstream communication ports	2
Number of downstream protocols supported simultaneously	2
USB port for configuration	Yes
Two RJ-45 Ethernet ports—10/100Base-T	Yes
Modbus TCP/IP protocols supported	Yes
SNMP client access v.1	Yes
INCOM slave action commands supported	Yes
INCOM date and time settings supported	Yes
Modbus write commands supported from Modbus master	Yes
Device summary screens per main, bus and device	Yes
Event notification via the Web interface	Yes
Secure Ethernet communications—SSL encryption	Yes
Secure communication ports via access control/trusted host list	Yes
IPv4 support	Yes
Save and restore configuration file	Yes
Interval logging—csv file format, downloadable to Excel	Yes
Ability to upload additional or modified EDS files	No
Device waveform access and storage—COMTRADE file format	No
Set user-defined events	No
Trend graph displayed	Yes
Data logging—csv file format, downloadable to Excel	No
Event logging—csv file format, downloadable to Excel	No
E-mail notification on events and threshold alarms	No
Custom summary Web page creation	No
Ability to create custom events	No
Supports SAM3Z energy meters	No
BACnet/IP support ①	Yes

① Expected availability 4Q11.

**The Eaton Power Xpert Gateway 200E Includes:**

- The Power Xpert Gateway module
- Mounting provisions and required hardware for panel and DIN rail mounting
- CD-ROM: contains the user manual, Modbus register maps, USB driver and other associated files

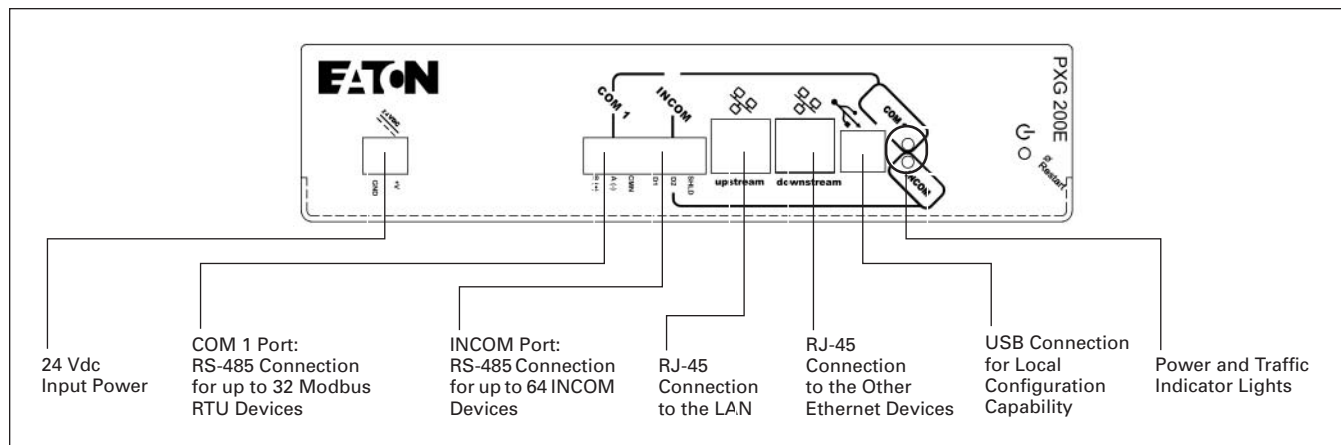

**Figure 2.1-1. Power Xpert Gateway with DIN Rail Mounting (Brackets Included)**
**Table 2.1-2. Supported Devices**

Supported Devices			HTTP	Web Services	MB TCP	INCOM Pass-Thru	SNMP	File Export csv	Modbus Pass-Thru	BACnet/IP
Protocol	Device Type	Device Name								
INCOM	I/O	DIM KYZ (WAGES)	■	■	■	■	■	■		■
INCOM	Meter	IQ MESII	■	■	■	■	■	■		■
INCOM	Meter	IQ 220/230	■	■	■	■	■	■		■
INCOM	Meter	IQ Energy Sentinel	■	■	■	■	■	■		■
Modbus	Meter	IQ 130	■	■	■		■	■	■	■
Modbus	Meter	IQ 140	■	■	■		■	■	■	■
Modbus	Meter	IQ 150	■	■	■		■	■	■	■
Modbus	Meter	IQ 220M/230M	■	■	■		■	■	■	■
Modbus	Meter	IQ 250	■	■	■		■	■	■	■
Modbus	Meter	IQ 260	■	■	■		■	■	■	■
Modbus	Meter	EI NEXUS 1200 Series	■	■	■		■	■	■	■
Modbus	Meter	IQ 35M	■	■	■		■	■	■	■

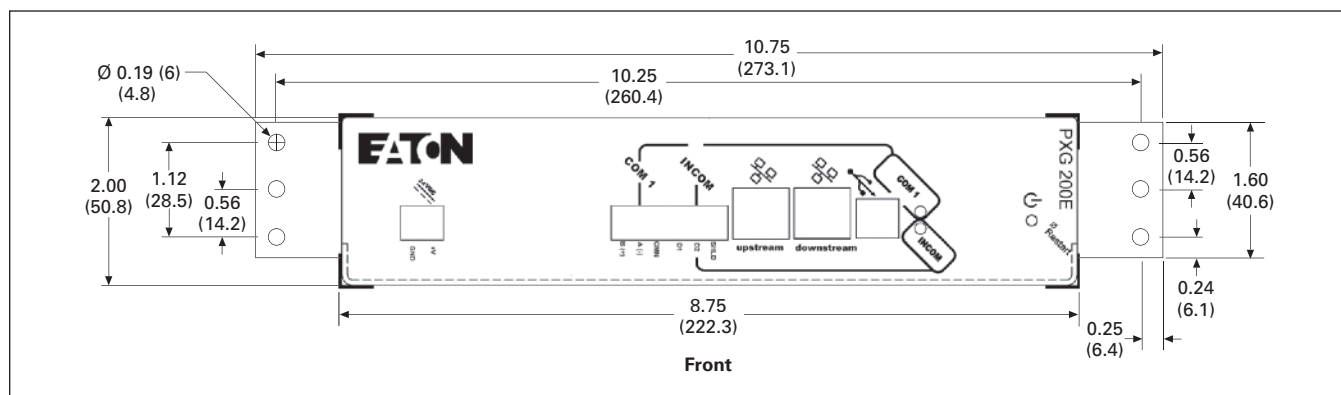


## Dimensions

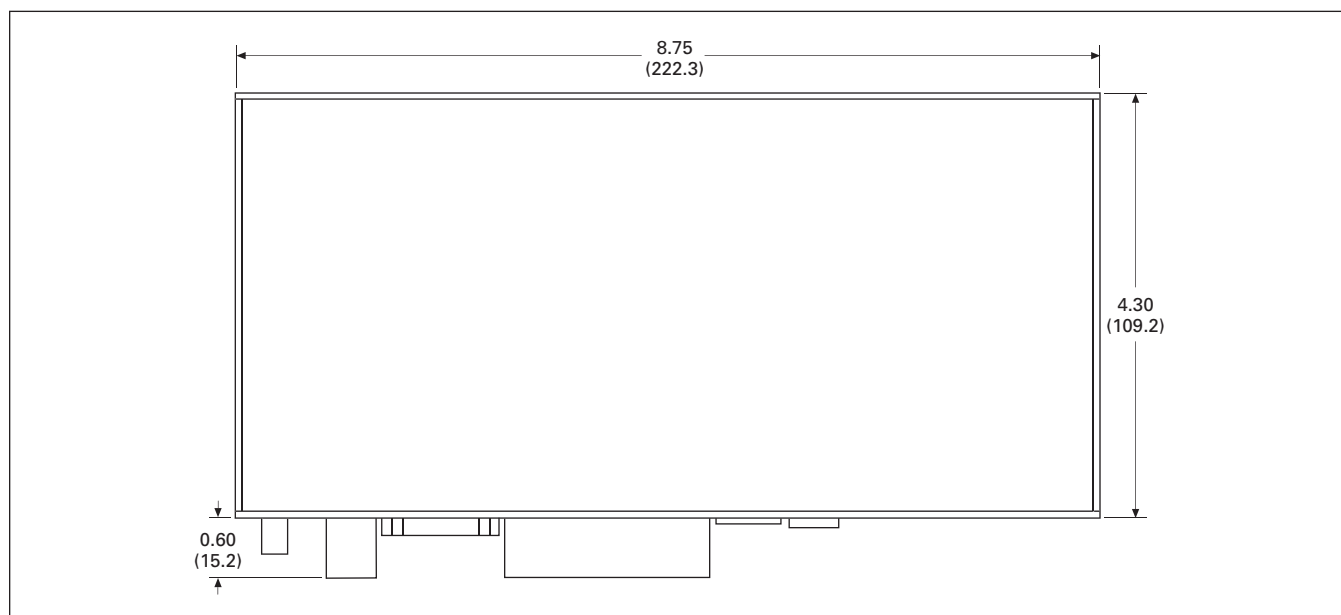
### Power Xpert Gateway—Dimensions in Inches (mm)



**Figure 2.1-2. Power Xpert Gateway 200E**



**Figure 2.1-3. Power Xpert Gateway 200E with Standard Panel Mounting (Brackets Included)**



**Figure 2.1-4. Power Xpert Gateway 200E**

## Technical Data and Specifications

## Technical Data and Specifications

Table 2.1-3. PXG 200E Part Numbers

Description	Style Number	Catalog Number
Power Xpert Gateway 200E Power supply—24 Vdc Mounting bracket kit	103008420-5591 ELC-PS02 66B2146G01	PXG200E ELC-PS02 PXGACC01

2

**Memory**

- Flash: 1 GB
- RAM: 128 MB

**Communication Ports**

- Network port: two 10/100Base-T RJ-45 connector
- Configuration port: one USB port
- Serial ports PXG 200E
  - One RS-485 port for connection to INCOM devices
  - One RS-485 port for connection to Modbus RTU devices

**Network Protocols Supported**

- Modbus TCP/IP: supports data access from Modbus TCP clients
- Web server: supports data access from Web browsers (HTTP and HTTPS)
- DHCP: supports automatic IP address assignments, if enabled
- SNMP: supports common network management tools
- NTP: supports time synchronization via a network time server for PXG synchronization
- SMTP: supports mail server for e-mail notification
- BACnet/IP: supports data access from BACnet/IP clients

**Note:** BACnet/IP support expected 4Q11.

**Serial Protocols Supported**

- INCOM
- Modbus RTU

**Supported Devices**

Refer to [www.eaton.com/pvg](http://www.eaton.com/pvg) for most current list. Call for information on additional devices.

**Web Browsers Recommended**

- IE 6.0 or higher
- Mozilla Firefox 2.0 or higher
- Google Chrome: Future

**Note:** Future; see [www.eaton.com/pvg](http://www.eaton.com/pvg) for most recent specifications.

**Number of Devices Supported**

- PXG 200E
  - 64 total with INCOM Port + COM 1 port not to exceed 64. Port limitations are as follows:
    - INCOM port: up to 64 INCOM devices
    - COM 1 port: up to 32 Modbus devices

**Power Input**

- Input voltage, nominal: 24 Vdc; 0.8A
- Input voltage range:  $\pm 20\%$  Nominal

**Power Consumption**

- 8 watts maximum

**Operating Temperature**

- 32° to 140°F (0° to 60°C)

**Ambient Storage Temperature**

- -40° to 185°F (-40° to 85°C)

**Relative Humidity**

- 5 to 95% noncondensing at 50°C

**Size (H x D x L) in Inches (mm)**

- 2.10 x 4.50 x 8.90 (53.3 x 114.3 x 226.1)

**Weight**

- 1.5 lbs

**Regulatory and Standards Compliance**

- UL® 508, Standard for Programmable Controller Equipment
- FCC, Class A, Part 15, Subpart B, Sections 15.107b and 15.109b
- EN55022: 1994 Class A, Information Technology Equipment
- EN 61000-6-2:2001 Electromagnetic Compatibility (EMC) Part 6-2: Immunity for Industrial Environments

**Note:** Features and specifications listed in this document are subject to change without notice and represent the maximum capabilities of the product with all options installed. Although every attempt has been made to ensure the accuracy of information contained within, Eaton makes no representation about the completeness, correctness or accuracy and assumes no responsibility for any errors or omissions. Features and functionality may vary depending on selected options.

**PXG-E Daisy Chain Application**

The PXG-E allows for units to be connected together through two RJ-45 10/100 connectors on the front of the PXG-E series of products. This arrangement is a pass-through of Ethernet communications allowing a single network drop to connect up to five Ethernet communicating devices. The maximum length of a copper cable run should not exceed 295 ft (90m) total.

**Note:** In this configuration, if any of the PXG-E units go offline or lose power, the communication to the downstream Ethernet devices will lose connection to the LAN.

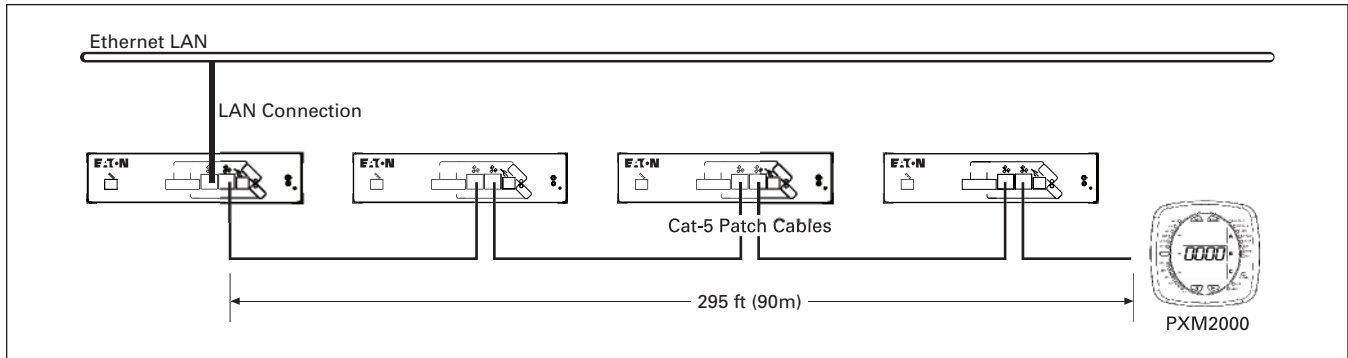


Figure 2.1-5. PXG-E Daisy Chain Application

### Power Xpert Gateways

2

## Power Xpert Gateway 400E/600E/800E



*Power Xpert Gateways 400E, 600E and 800E are typically installed in an electrical assembly—a motor control center, low/medium voltage switchgear or switchboard to consolidate data available from components such as trip units, meters, motor controllers and protective relays.*

### General Description

Power Xpert Gateways 400E, 600E and 800E (PXG 400E/600E/800E) provide a cost-effective method to easily Web-enable Eaton and third-party products.

The PXG 400E/600E/800E series offers improved performance over the previously offered series, logging in the PXG 600E/800E, daisy chaining capabilities (Page 2.1-8, Figure 2.1-8) and design enhancements including a new processor and additional RAM and Flash memory.

The gateway consists of an embedded Web server that allows the user to connect to Eaton products such as breakers, meters and relays found in MCCs, LV and MV switchgear and switchboards—to name a few—that communicate via Eaton protocols INCOM and QCPort, in addition to third-party products that communicate via Modbus RTU. The Gateway provides the central connection point for the power metering/monitoring/protective devices, allowing their parameters to be monitored via the Web.

The PXG 400E/600E/800E provide data communications to Eaton's Power Xpert Software to facilitate centralizing and gathering data for long-term data archival, analysis and trending features.

The PXG 400E/600E/800E are compatible with and facilitate integration with many third-party building and factory automation systems via Modbus TCP and Web services.

**Note:** Enclosed solution available. Contact your Eaton sales office for more details.

The PXG 600E/800E allow you to enable pre-selected parameters to be trended for each supported device. Selecting the trend symbol will generate a real-time graph for that parameter and can be viewed for the past 24 hours, seven days, 30 days or all past history.

The PXG 600E/800E also offer direct e-mail notifications to up to 10 users. Select from event notifications, data logs, interval log, event logs and heartbeat emails.

The PXG 800E brings this communication hardware-only solution closer to those requirements that have previously only been met by a software package. The PXG 800E includes all the functionality of the PXG 600E. Additional features include:

- Creation of custom summary Web pages on the user interface
- Ability to create custom events from existing device parameters or events
- Ability to communicate wirelessly with the SAM3Z submetering system

In the PXG 400E/600E/800E, information is presented in organized, user-friendly Web pages and includes, but is not limited to, the following:

- Device status
- Comm status
- Voltage
- Current
- Power
- Power factor
- Energy
- Power quality
- Temperature
- I/O states

### Power Xpert Gateway Screenshots

Downstream devices on the Power Xpert Gateways often report key operating status information that warrants immediate attention. The PXG identifies a set of key status values for each device and generates "Events" in response to changes in these status values. An example of a device event is an overcurrent trip on a circuit breaker.

In addition to displaying events on its home page, the PXG reports events to monitoring software such as Power Xpert Software. These events will then be integrated with those from across the power system, providing unified enterprise level event management.



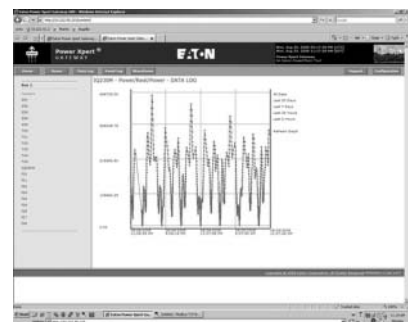
Home Page



Bus Page



Device Page



Trending Page (PXG 600E/800E Only)

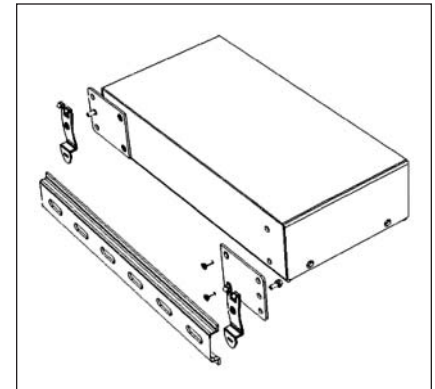
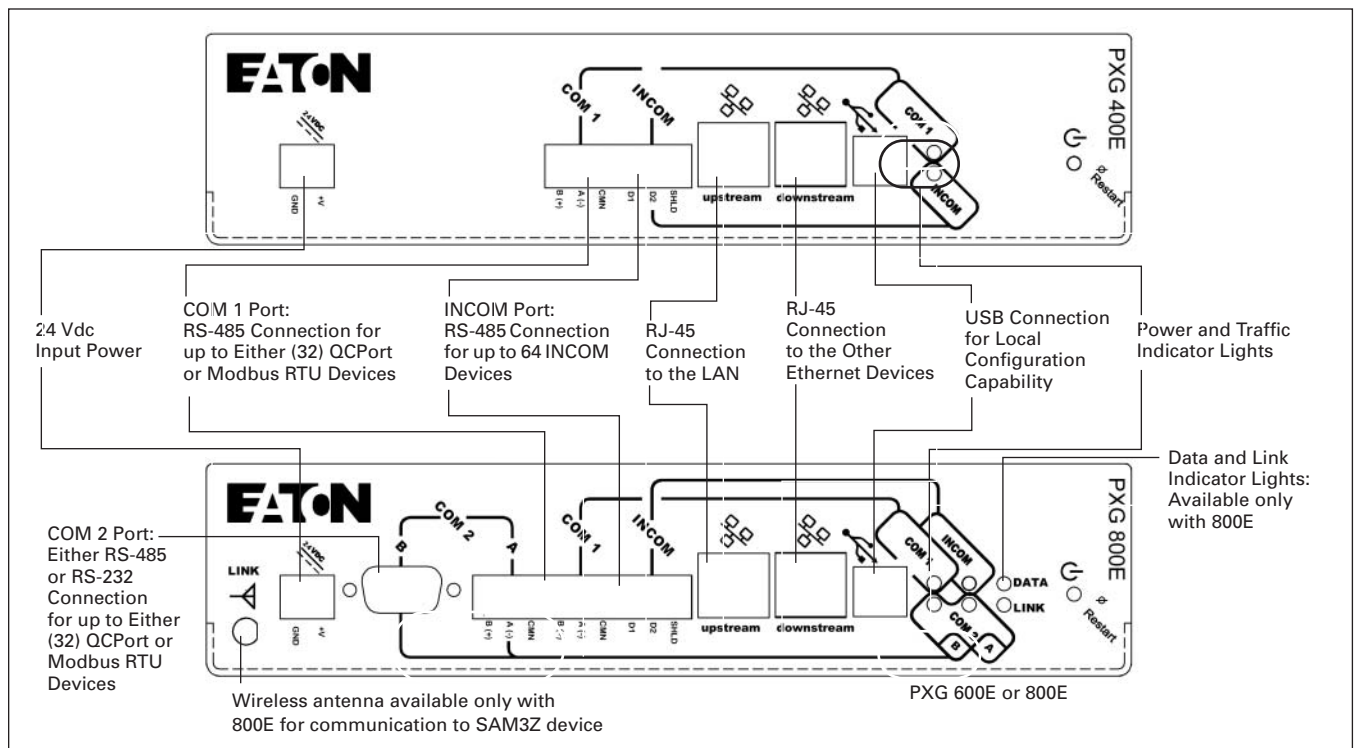
**Power Xpert Gateways**
**Table 2.1-4. Features of the PXG-E Product Offering**

Features	PXG 400E	PXG 600E	PXG 800E
Total number of supported devices	64	96	96
Maximum number of INCOM devices supported	64	64	64
Protocols supported on downstream devices: (INCOM, Modbus RTU and QCPort)	Yes	Yes	Yes
Number of downstream communication ports	2	3	3
Number of downstream protocols supported simultaneously	2	3	3
USB port for configuration	Yes	Yes	Yes
Two RJ-45 Ethernet ports—10/100Base-T	Yes	Yes	Yes
Modbus TCP/IP protocols supported	Yes	Yes	Yes
SNMP client access v.1	Yes	Yes	Yes
INCOM slave action commands supported	Yes	Yes	Yes
INCOM date and time settings supported	Yes	Yes	Yes
Modbus write commands supported from Modbus master	Yes	Yes	Yes
Device summary screens per main, bus and device	Yes	Yes	Yes
Event notification via the Web interface	Yes	Yes	Yes
Secure Ethernet communications—SSL encryption	Yes	Yes	Yes
Secure communication ports via access control/trusted host list	Yes	Yes	Yes
IPv4 support	Yes	Yes	Yes
Ability to upload additional or modified EDS files	Yes	Yes	Yes
Save and restore configuration file	Yes	Yes	Yes
Device waveform access and storage—COMTRADE file format	No	Yes	Yes
Set user-defined events	No	Yes	Yes
Trend graph displayed	No	Yes	Yes
Data logging—csv file format, downloadable to Excel	No	Yes	Yes
Interval logging—csv file format, downloadable to Excel	No	Yes	Yes
Event logging—csv file format, downloadable to Excel	No	Yes	Yes
E-mail notification on events and threshold alarms	No	Yes	Yes
Custom summary Web page creation	No	No	Yes
Ability to create custom events	No	No	Yes
Supports SAM3Z energy meters	No	No	Yes
BACnet/IP protocol supported ①	—	—	—

① Expected availability 4Q11.

**The Eaton Power Xpert Gateway Includes:**

- The Power Xpert Gateway module
- Mounting provisions and required hardware for panel and DIN rail mounting
- CD-ROM: contains the user manual, Modbus register maps, USB driver and other associated files


**Figure 2.1-7. Power Xpert Gateway with DIN Rail Mounting (Brackets Included)**
**2**

**Figure 2.1-6. Power Xpert Gateway 400E/600E/800E**

### Technical Specifications

#### PXG-E Daisy Chain Application

The PXG-E allows for units to be connected together through two RJ-45 10/100 connectors on the front of the PXG-E series of products. This arrangement is a pass-through of Ethernet communications allowing a single network drop to connect up to five Ethernet communicating devices. The maximum length of a copper cable run should not exceed 295 ft (90m) total.

**Note:** In this configuration, if any of the PXG-E units go offline or lose power, the communication to the downstream Ethernet devices will lose connection to the LAN.

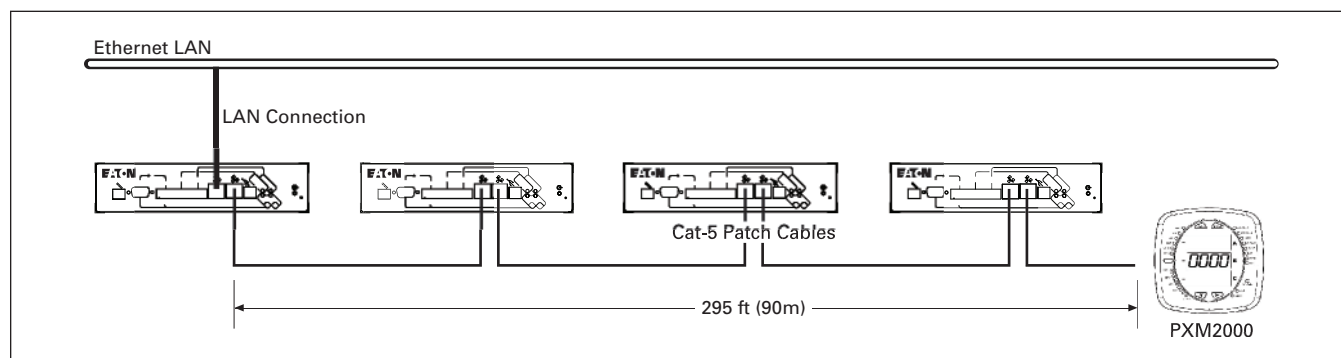




Figure 2.1-8. PXG-E Daisy Chain Application



## Connectivity Matrix

Table 2.1-5. Data Acquisition and Integration Table For Supported Devices

Supported Devices											
Device Type	Device Name	PXG 400E/600E/800E							PXG 600E/800E Only		
		HTTP (Web Browser)	Web Services (Power Xpert Software)	Modbus TCP (BMS and SCADA)	Pass-through INCOM (PowerNet)	Pass-through OCPort (CHStudio)	SNMP (NIMS)	BACnet/IP	SMTP (E-mail Client)	File Export (Data File Format)	File Export (Waveform File Export)
<b>INCOM</b>											
Drive	Accutrol 400	■	■	■	■		■	■	■	■	
Drive	AF97	■	■	■	■		■	■	■	■	
I/O	Universal RTD	■	■	■	■		■	■	■	■	
I/O	DIM	■	■	■	■		■	■	■	■	
I/O	DIM KYZ	■	■	■	■		■	■	■	■	
Meter	IQ DP-4000 ①	■	■	■	■		■	■	■	■	
Meter	IQ Energy Sentinel	■	■	■	■		■	■	■	■	
Meter	IQ 220/IQ 320	■	■	■	■		■	■	■	■	
Meter	IQ 230/IQ 330	■	■	■	■		■	■	■	■	
Meter	IQ Analyzer (6000/6200) ①	■	■	■	■		■	■	■	■	■
Meter	IQ Analyzer (6400/6600) ①	■	■	■	■		■	■	■	■	■
Meter	IQ Data ①	■	■	■	■		■	■	■	■	
Meter	IQ Data Plus ①	■	■	■	■		■	■	■	■	
Meter	IQ Data Plus II ①	■	■	■	■		■	■	■	■	
Meter	Power Manager	■	■	■	■		■	■	■	■	
Meter	IQ Power Sentinel	■	■	■	■		■	■	■	■	
Meter point	IQ MES II	■	■	■	■		■	■	■	■	
Protective	Digitrip 3000	■	■	■	■		■	■	■	■	
Protective	Digitrip 3200	■	■	■	■		■	■	■	■	
Protective	FP-6000	■	■	■	■		■	■	■	■	■
Protective	FP-5000	■	■	■	■		■	■	■	■	■
Protective	FP-4000	■	■	■	■		■	■	■	■	■
Protective	MP-3000 ①	■	■	■	■		■	■	■	■	
Protective	MP-4000 ①	■	■	■	■		■	■	■	■	
Protective	Digitrip 520MC	■	■	■	■		■	■	■	■	
Protective	NRX520	■	■	■	■		■	■	■	■	
Protective	IQ 500	■	■	■	■		■	■	■	■	
Protective	MPCV Relay	■	■	■	■		■	■	■	■	
Protective	Digitrip 1150/DT1150V	■	■	■	■		■	■	■	■	■
Protective	Digitrip 810	■	■	■	■		■	■	■	■	
Protective	Digitrip 910	■	■	■	■		■	■	■	■	
Protective	Digitrip MV	■	■	■	■		■	■	■	■	
Protective	Digitrip OPTIM 1050	■	■	■	■		■	■	■	■	■
Protective	Digitrip OPTIM 550	■	■	■	■		■	■	■	■	
Protective	Digitrip OPTIM 750	■	■	■	■		■	■	■	■	
Starter	Advantage ②	■	■	■	■		■	■	■	■	
Starter	Advantage ACM ②	■	■	■	■		■	■	■	■	
Subnetwork master	AEM II ①	■	■	■	■				■	■	
Subnetwork master	BIM II ①	■	■	■	■				■	■	
Subnetwork master	CMU ②	■	■	■	■				■	■	
Subnetwork master	IQ CED II ①	■	■	■	■				■	■	
Subnetwork master	IQ MES II	■	■	■	■		■	■	■	■	
Transfer switch	ATC-400 ①	■	■	■	■		■	■	■	■	
Transfer switch	ATC-600 ①	■	■	■	■		■	■	■	■	
Transfer Switch	ATC-800 ①	■	■	■	■		■	■	■	■	



① Required IPONI for connection to the Power Xpert Gateway.

② Required a WPONI for connection to the Power Xpert Gateway.

**Note:** Information subject to change without notice. Visit [www.eaton.com/pxg](http://www.eaton.com/pxg) for latest up-to-date details on connectivity.

## Connectivity Matrix

Table 2.1-5. Data Acquisition and Integration Table For Supported Devices (Continued)

Supported Devices											
Device Type	Device Name	PXG 400E/600E/800E							PXG 600E/800E Only		
		HTTP (Web Browser)	Web Services (Power Xpert Software)	Modbus TCP (BMS and SCADA)	Pass-through INCOM (PowerNet)	Pass-through QCPort (CHStudio)	SNMP (NMS)	BACnet/IP	SMTP (E-mail Client)	File Export (Data File Format)	File Export (Waveform File Export)
Modbus											
Drive	MVX9000	■	■	■			■	■	■	■	
Drive	SVX9000	■	■	■			■	■	■	■	
Insulation monitor	InsulGard	■	■	■			■	■	■	■	
Meter	IQ 130	■	■	■			■	■	■	■	
Meter	IQ 140	■	■	■			■	■	■	■	
Meter	IQ 150	■	■	■			■	■	■	■	
Meter	IQ 220M/230M	■	■	■			■	■	■	■	
Meter	IQ 250	■	■	■			■	■	■	■	
Meter	IQ 260	■	■	■			■	■	■	■	
Meter	IQ 35M	■	■	■			■	■	■	■	
Meter	Nexus 1262	■	■	■			■	■	■	■	
Meter	SQD CM3000 Series	■	■	■			■	■	■	■	
Meter	SQD CM4000 Series	■	■	■			■	■	■	■	
Meter	SQD PM710	■	■	■			■	■	■	■	
Meter	SQD PM850	■	■	■			■	■	■	■	
Meter	PML 7350	■	■	■			■	■	■	■	
Meter	PML 7550	■	■	■			■	■	■	■	
Meter	PML 7650	■	■	■			■	■	■	■	
Meter	PM3	■	■	■			■	■	■	■	
Protective	GE 369 Motor Relay	■	■	■			■	■	■	■	
Protective	GE 469 Motor Relay	■	■	■			■	■	■	■	
Protective	FP-4000/FP-5000	■	■	■			■	■	■	■	
Protective	FP-6000	■	■	■			■	■	■	■	
Overload relay	C441	■	■	■			■	■	■	■	
Temp monitor	Qualitrol 118	■	■	■			■	■	■	■	
Temp monitor	TC-50	■	■	■			■	■	■	■	
Temp monitor	TC-100	■	■	■			■	■	■	■	
Transformer differential relay	ABB TPU 2000	■	■	■			■	■	■	■	
QCPort											
I/O	D77A-AI16	■	■	■		■	■	■	■	■	
I/O	D77A-AI8	■	■	■		■	■	■	■	■	
I/O	D77A-DI16	■	■	■		■	■	■	■	■	
I/O	D77A-DI8	■	■	■		■	■	■	■	■	
Starter	IT S811 (MV811)	■	■	■		■	■	■	■	■	
Starter	IT Starter ③	■	■	■		■	■	■	■	■	
Starter	IT Starter QSNAP ③	■	■	■		■	■	■	■	■	

③ Requires a QSNAP for connection to the Power Xpert Gateway.

**Note:** Information subject to change without notice. Visit [www.eaton.com/pxg](http://www.eaton.com/pxg) for latest up-to-date details on connectivity.**Note:** Additional supported devices will be available via firmware updates. Contact your local Eaton sales office for help with devices not currently listed in **Table 2.1-5**.

## Product Selection

The table below represents many of the parameters displayed on the Web page for a given device; however, it is not exhaustive. For the complete list of parameters display, per device, refer to the Device Data Map file at <http://www.eaton.com/pxg>.

### Table 2.1-6. Web UI Device Parameters Displayed via Power Xpert Gateway

Units	IQ Meters																		Circuit Breaker Trip Units					Protective Relays												
	IQ Data Plus II	IQ Data Plus	IQ Data	IQ Analyzer 6000/6200	IQ Analyzer 6400/6600	IQ DP-4000	IQ 220/320	IQ 230/330	IQ 230/330M	IQ 250	IQ 260	IQ Power Sentinel	IQ Energy Sentinel	IQ MESII	IQ 130	IQ 140	IQ 150	IQ 35M	Power Manager	Digirtrip 1150	Digirtrip 520MC	Digirtrip RMS 910	Digirtrip RMS 810	Digirtrip OPTIM 1050	Digirtrip OPTIM 550	Digirtrip OPTIM 750	Digirtrip MV	Digirtrip 3000	Digirtrip 3200	IQ 500	MPVCV Relay	FP-4000	FP-5000	MP-3000	MP-4000	FP-6000

### Voltage

[illegible]

**Current**

[illegible]

## Power

[illegible]**Power Factor**[illegible]

## Energy

[illegible]

### Power Quality

[illegible]

### Temperature

[illegible]

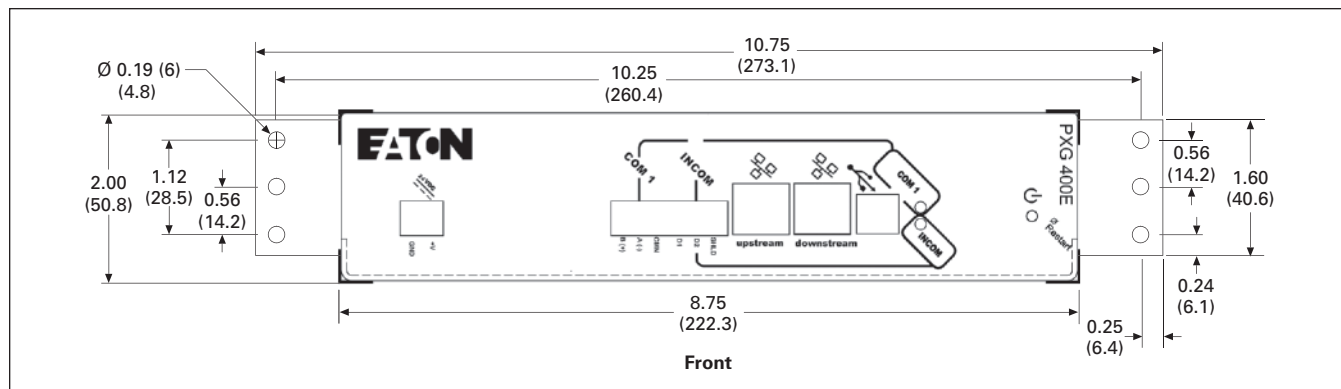
### Input Status

[illegible]

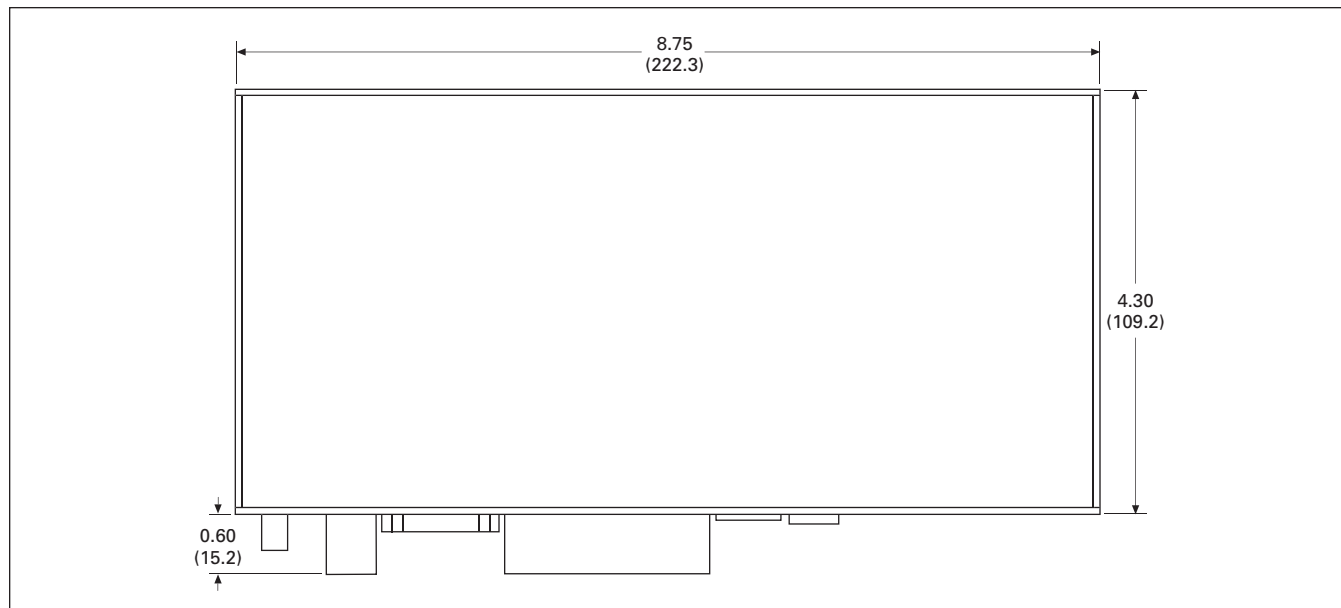


**Dimensions**

**Power Xpert Gateway—Dimensions in Inches (mm)**



**Figure 2.1-9. Power Xpert Gateway 400E/600E/800E with Standard Panel Mounting (Brackets Included)**



**Figure 2.1-10. Power Xpert Gateway 400E/600E/800E**

## Technical Data and Specifications

Table 2.1-7. PXG Part Numbers

Description	Style Number	Catalog Number
Power Xpert Gateway 400E Power Xpert Gateway 600E Power Xpert Gateway 800E	103008421-5591 103008422-5591 103008423-5591	PXG400E PXG600E PXG800E
Wireless energy meter for PXG 800E Wireless repeater module for SAM3Z Power supply—24 Vdc Mounting bracket kit	P-103000007-591 P-103000008-591 ELC-PS02 66B2146G01	SAM3Z EZR ELC-PS02 PXGACC01

## Memory

- Flash: 1 GB—400E/600E  
2 GB—800E
- RAM: 128 MB

## Communication Ports

- Network port: two 10/100Base-T RJ-45 connectors
- Configuration port: one USB port
- Serial ports PXG 400E
  - One dedicated RS-485 port for connection to INCOM devices
  - One RS-485 port for connection to either QCPort or Modbus RTU devices
- Serial ports PXG 600E/800E
  - One dedicated RS-485 port for connection to INCOM devices
  - One RS-485 port for connection to either QCPort or Modbus RTU devices
  - One RS-485 or RS-232 (software selectable) port for connection to either QCPort or Modbus RTU devices

## Network Protocols Supported

- Modbus TCP/IP: supports data access from Modbus TCP clients
- Web server: supports data access from Web browsers (HTTP and HTTPS)
- DHCP: supports automatic IP address assignments, if enabled
- SNMP: supports common network management tools
- NTP: supports time synchronization via a network time server for PXG synchronization
- SMTP: supports mail server for e-mail notification
- BACnet/IP: supports data access from BACnet/IP clients

**Note:** BACnet/IP support expected 4Q11.

## Serial Protocols Supported

- INCOM
- QCPort
- Modbus RTU

## Supported Devices

Refer to [www.eaton.com/pvg](http://www.eaton.com/pvg) for most current list. Call for information on additional devices.

## Web Browsers Recommended

- IE 6.0 or higher
- Mozilla Firefox 2.0 or higher
- Google Chrome (future)

## Number of Devices Supported

- PXG 400E
  - 64 total with INCOM Port + COM 1 port not to exceed 64. Port limitations are as follows:
    - INCOM port: up to 64 INCOM devices
    - COM 1 port: up to 32 QCPort or Modbus RTU devices
- PXG 600E/800E
  - 96 total with INCOM Port + COM 1 port + COM 2 PORT not to exceed 96. Port limitations are as follows:
    - INCOM port: up to 64 INCOM devices
    - COM 1 port: up to 32 QCPort or Modbus RTU devices
    - COM 2 port: up to 32 QCPort or Modbus RTU devices
    - COM 3 port: the SAM3Z energy meter is the only supported device

**Note:** PXG 800E—up to 96 total devices.

## Power Input

- Input voltage, nominal: 24 Vdc; 0.8A
- Input voltage range:  $\pm 20\%$  Nominal

## Power Consumption

- 8 watts maximum

## Operating Temperature

- 32° to 140°F (0° to 60°C)

## Ambient Storage Temperature

- –40° to 185°F (–40° to 85°C)

## Relative Humidity

- 5 to 95% noncondensing at 50°C

## Size (H x D x L) in Inches (mm)

- 2.10 x 4.50 x 8.90 (53.3 x 114.3 x 226.1)

## Weight

- 1.5 lbs

## Regulatory and Standards Compliance

- UL 508, Standard for Programmable Controller Equipment
- FCC, Class A, Part 15, Subpart B, Sections 15.107b and 15.109b
- EN55022: 1994 Class A, Information Technology Equipment
- EN 61000-6-2:2001 Electromagnetic Compatibility (EMC) Part 6-2: Immunity for Industrial Environments

**Note:** Features and specifications listed in this document are subject to change without notice and represent the maximum capabilities of the product with all options installed. Although every attempt has been made to ensure the accuracy of information contained within, Eaton makes no representation about the completeness, correctness or accuracy and assumes no responsibility for any errors or omissions. Features and functionality may vary depending on selected options.



## Wiring Guidelines

## General Wiring Guidelines—RS-485 Network

Table 2.1-8. RS-485 Wiring Guide—Three Terminal Devices

Device Name	A (– Wire)	B (+ Wire)	Common Wire	XCVR Common ①	Data Bias
IQ 230M	12 (MOD2)	11 (MOD1)	10 (INCOM 3)	I 26V	None
IQ 250	(–) Older Models are Marked B (–)	(+) Older Models are Marked A (–) or A (+)	SH	I	None
IQ 260	(–) Older Models are Marked B (–)	(+) Older Models are Marked A (–) or A (+)	SH	I	None
IQ 330M	12 (MOD2)	11 (MOD1)	10 (INCOM 3)	I 26V	None
InsulGard ②	B	A	None	Floating	None
Bushing Gard ② (InsulGard G3 ②)	B	A	None	Floating	None
Power Xpert Meter ③ 4000/6000/8000	Data A 750B-S	Data B 750B-S	Shield (COM)	I 300V	750 Ohm Switch Sel
Power Xpert Gateways	A(–)	B(+)	COM	I	—

① Transceiver (XCVR) Common Connected to:

I = Isolated

NI = Non Isolated

E = Earth Ground

② Center terminal on Insulgard (marked with Ground symbol) is for shield splicing only and is electrically floating.

③ The Power Xpert Meter 4000/6000/8000 is directly compatible with Ethernet networks and does not need a Power Xpert Gateway. See **Tab 3** for more details.

When communicating over RS-485 networks to Eaton products, the following general wiring guidelines should be used.

### Rule 1: Cable Selection — Twisted Shielded Pair (TSP)

Note cables specifically designed for RS-485 applications are highly recommended. The RS-485 bus is a length of twisted shielded pair (TSP) that includes a third conductor (used for the common wire), a braided shield accompanied by a drain wire, and nominal impedance of 120 ohms.

- Belden Wire and Cable Company Part Number 3106A or equivalent

### Rule 2: Cable Intermixing

Any cable in the Belden 3106A family can be intermixed with each other in the Modbus network.

**Note:** For fiber optic wiring guidelines, see **Pages 2.2-2 and 2.2-3.**

### Rule 3: System Topology, Size and Capacity

- Strict daisy chain must be adhered to. A strict daisy chain configuration is one where the transmission line connects from one RS-485 receiver to the next. The transmission line appears as one continuous line to the RS-485 driver
- Maximum 32 devices
- Line termination: maximum cable lengths of 4000 ft (1219m); longer bus lengths will slow the data rate

### Rule 4: Cable Splicing

The prime goal is to create a secure electrical connection while minimizing exposure to electrical transients. Ferrules are used to dress cable ends. Most devices have built-in terminal blocks which can be used for splicing. Additionally, terminal blocks should be utilized when splicing elsewhere in the gear or facility to ensure a secure electrical connection.

### Rule 5: Cable Shielding

The cable shielding and outer jacket should not be stripped back beyond 1.50 inches (38 mm). Three-pole terminal blocks are used to ensure a continuous metallic shield ground path. To ensure a secure electrical connection when daisy chaining devices that have built-in two-pole terminal blocks, mechanically crimp sleeves onto the two shield path drain wires.

### Rule 6: Cable Grounding

Ground the communication network at only one point in the network, preferably by terminating the drain wire to ground at the EOL node (same location as the EOLR). A solid earth ground is accomplished by connecting the shield ground path's drain wire to a #14 AWG or larger multi-stranded wire that has an impedance path of 1 ohm or less to a known earth ground.

**Note:** The building electrical ground may not be effective since it may travel through many connections and considerable distances before reaching earth ground. In such cases a new ground path will be required since the effectiveness of this shield earth ground connection will affect the integrity of data transferred over the cable.

### Rule 7: Cable Termination

End of Line Resistors (EOLR) are necessary to maintain signal strength and minimize reflections. EOLR must match the impedance of the TSP. Two EOLR are needed and should be located at both ends of the RS-485 bus. If there is only one device connected to the Modbus master, it is considered the last device in the network and should be terminated with a 120 ohm 1/4 watt terminating resistor.

### Rule 8: Device Addressing

- Each device must have a unique slave address
- No two devices on the same RS-485 network can have the same slave address

### Ethernet Cable Specifications

For complete specifications, refer to the IEEE 802.3 Ethernet specification.

## Wiring Guidelines

2

**INCOM Network**

INCOM was specifically designed with the intention of delivering a comprehensive and powerful energy management solution for use in electrical distribution environments while ensuring affordability, flexibility, simplicity and noise immunity. An INCOM network installed per the following rules will allow the user to fully realize all of the above advantages. (Refer to Eaton document TD17513 for specific system layout recommendations and details.)

**Rule 1: Cable Selection—  
Twisted Shielded Pair**

Approved cable types:

- Any of the cables in the Belden 9463 family
- Quabbin 6205
- CommScope 9022
- Manhattan Electric M4154
- IMPCABLE—a 600V rated cable custom designed for INCOM — Style # 2A95705G01

**Rule 2: Cable Intermixing**

Due to impedance differences between IMPCABLE and the Belden 9463 family, the main cable run(s) should be entirely for the 9463 family OR IMPCABLE: do not alternate between these types. The cable used for taps can be different from the main run.

**Rule 3: System Topology, Size and Capacity**

Supports Daisy Chain, Star and Multi-Level Network Segment Topologies. (Note: Star Segment Topology is not recommended for new designs). See **Figure 2.1-10**. Surge protection is required for FSK networks that leave a building at the egress/ingress of the building.

- Supports distances up to 10,000 ft (3048m) per segment when designed within the specifications of this guideline
- Supports up to 1000 devices on a single network segment
- Supports sub-network master devices and associated sub-networks
- Supports 1200 or 9600 baud rate.
- Attenuation:
  - Total system capacity: 25 dB
  - Attenuation per device: 0.01 dB
  - Attenuation for approved wire types (see **Tables 2.1-9** and **2.1-10**)

**Table 2.1-9. Cable Attenuation**

Cable Type	Attenuation/ 1000 ft (305m)
IMPCABLE	1.6 dB
Belden 9463 family	2.0 dB

**Table 2.1-10. Attenuation at Star**

Number of Long Lines	Attenuation
3	3.5 dB
4	6 dB
5	8 dB

## ■ Definitions:

- **Daisy chain:** point-to-point wiring between devices or clusters of devices
- **Star:** single point with a number of long lines emanating from it
- **Long line:** >200-ft (61m) wire run
- **Simple tap:** <200-ft (61m) connection to cluster of devices

**Rule 4: Cable Splicing**

The goal is to create a secure electrical connection while minimizing exposure to electrical transients. Ferrules are used to dress cable ends in order to avoid problems associated with frayed and loose wires. Besides facilitating cable installation, subsequent data line troubleshooting and downtime are minimized. Most INCOM devices have built in three pole terminal blocks for data lines and shield. For older INCOM devices that have only two terminals, shield continuity must be ensured by other means. Additional terminal strips should be utilized when splicing elsewhere in the electrical enclosure or facility to ensure secure electrical connections. All devices, End of Line Termination Resistors, and Taps should be wired in parallel across the cable.

**Rule 5: Cable Shielding**

The cable shielding and outer jacket should not be stripped back beyond 1.50 inches (38 mm). Terminal blocks are used at tap points to ensure a continuous metallic shield ground path. To ensure a secure electrical connection when daisy-chaining INCOM devices that have built-in two pole terminal blocks, use crimp sleeves to join the two shield drain wires. The cable shield ground path for a main network and sub-network must not be joined. Each should have a separate connection to earth ground reference.

**Rule 6: Cable Grounding**

The shield should be continuous across a network segment and connected to the building's electrical system grounding electrode conductor. The 2005 NEC provides the following guidance on grounding communication cables:

1. When a communication cable enters a building, a primary protector is required and must be grounded as described in section 800 IV. Specifically, paragraphs 800.93 and 800.100 define grounding requirements for the primary protector.
2. Grounding systems are generally covered by Section 250 III. The grounding electrode conductor is specifically covered by paragraphs 250.62, 250.64, 250.66, 250.68 and 250.70.
3. Bonding requirements between communication systems and the power distribution system is specified by Paragraph 250.94.

A solid earth ground is accomplished by connecting the shield ground path's drain wire to a #14 AWG or larger multi-stranded wire that has an impedance path of 1 ohm or less to the building's grounding electrode conductor.

**Rule 7: Cable Termination**

Each network segment requires a minimum of two End of Line Termination Resistors (EOLTRs). The EOLTRs maintain signal strength and minimize reflections. The EOLTRs should be 1/2 watt 100 ohm non-inductive resistors, such as carbon composition or metal film. Wire-wound resistors are not acceptable. Taps on network segments should not be terminated. Some INCOM devices have the EOLTR permanently installed and must be located at the end of a main run. Other INCOM devices have an EOLTR that can be switched to optionally terminate the network segment at the device. Care must be exercised when installing devices containing termination resistors that the switches are set appropriately. A minimum of two, up to a maximum of five EOLTRs must be installed on each network segment as dictated by network topology.

**Rule 8: Device Address**

In order to avoid the possibility of devices in a main network having the same addresses as those in subnetworks, set main network device addresses at 100 or higher excluding addresses 901 to 908.

## Wiring Guidelines

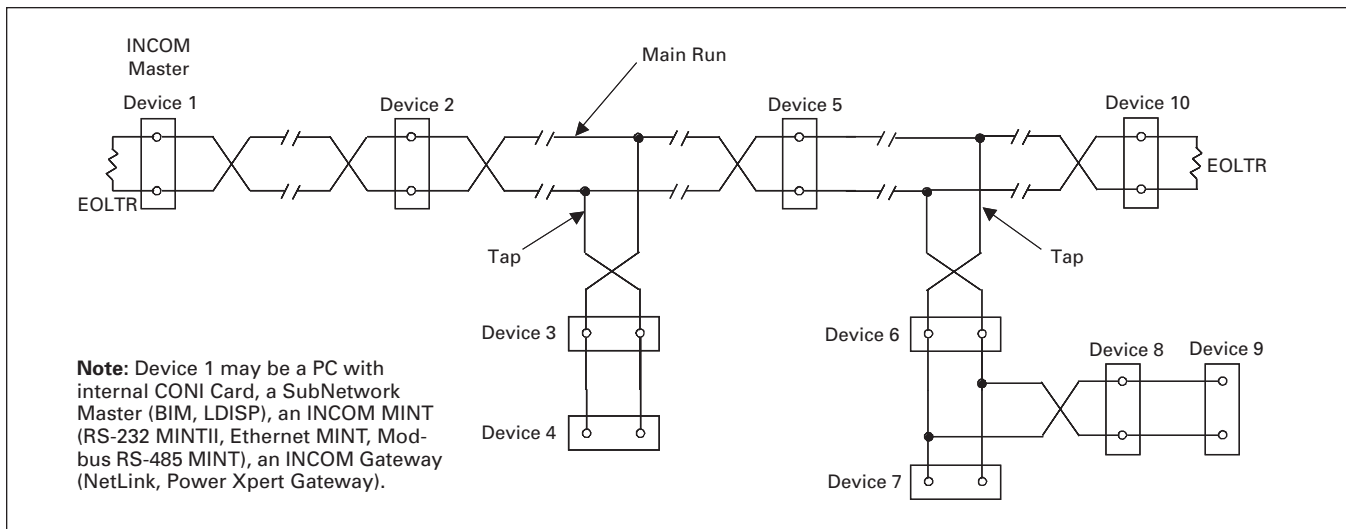


Figure 2.1-11. Daisy-Chain Segment Topology

## IQ Meters

Ethernet-Enabled Power  
Quality & Energy (PQ&E)—  
IQ Meters

IQ Digital Panel Meters

## General Description

The Power Xpert Gateway 400E supports a total of 64 devices. The Power Xpert Gateway 600E and 800E support up to 96 total devices, with a limit of 64 INCOM devices.

When designing a system using gateways, it is important to consider not only the number of devices that will communicate through a PXG 400E/600E/800E, but also the quantity of monitored parameters of each of its supported downstream devices.

For example, the number of the monitored parameters in the FP-5000 protective relay is 274, the maximum number of parameters per PXG 400E/

600E/800E is 8000. Dividing 8000 by 274 tells you that the maximum number of FP-5000s you can have downstream on a single PXG 400E/600E/800E is 28. Please contact your local Eaton sales office for a maximum number of downstream devices based on your monitored parameter requirements.

## Equipment

**Note:** For detailed equipment information, refer to Tab 3.

- IQ 35M meter—Modbus RS-485
- IQ MES II—INCOM
- IQ 130/140/150 meters
- IQ 250/260 meters—Modbus RS-485
- IQ 220/230 meters—INCOM
- IQ 320/330 meters—INCOM
- IQ DP-4000/4100 meters—INCOM
- IQ 6400/6600 meters—INCOM
- IQ Energy Sentinel/Power Sentinel meters—INCOM
- IQ Central Energy Display II—INCOM

## Options

- PXG 400E—Up to 64 IQ meters may be connected for Web browser access and INCOM translation for Power Xpert Software and Foreseer Services
- PXG 600E/800E—Up to 96 IQ meters may be connected for Web browser access, data logging, alarm notification, control commands, and INCOM translation for Power Xpert Software and Foreseer Services

## Communication Interfaces

- Modbus RTU (RS-485) or INCOM (downstream)
- Modbus TCP/IP (with PXG)
- HTTP (with PXG)
- XML/SOAP (with PXG)
- SMTP (with PXG 600E/800E)
- SNMP (with PXG 600E/800E)

## Metering/Monitoring Applications

- Real-time viewing of power/energy readings (PXG)
- View trended power/energy readings (PXG 600E/800E)
- User-defined events (PXG 600E/800E)
- E-mail notification (PXG 600E/800E)

## Installation Applications

- Low voltage switchgear
- Medium voltage switchgear
- Low voltage motor control centers
- Medium voltage motor starters

## Communications Applications

- Building Management System (BMS)
- Energy Management Systems
- Network Management Systems (NMS)
- HMI
- Power Xpert Software
- Power Xpert Reporting
- Foreseer Services

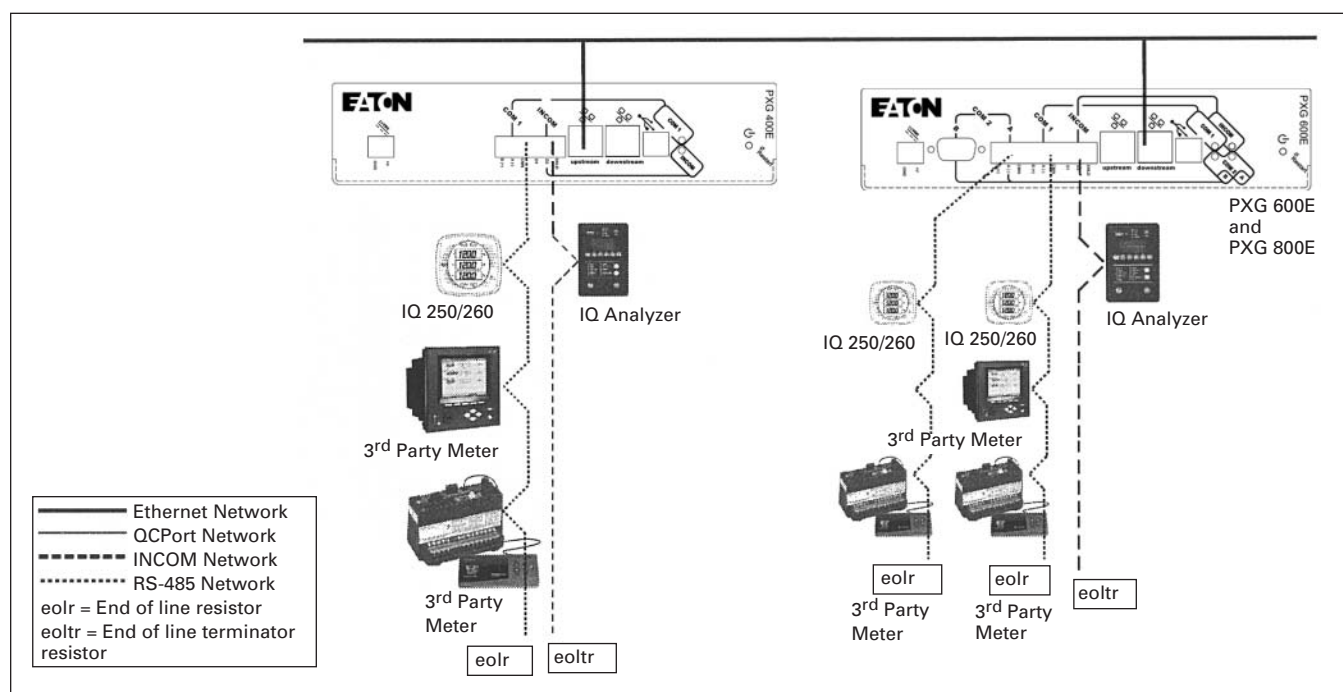


Figure 2.1-12. PXG Ethernet-Enabled IQ Meter Applications

**Note:** Many other devices supported. See complete supported device list at [www.eaton.com/pvg](http://www.eaton.com/pvg).

## Ethernet-Enabled Circuit Breaker Trip Units and Protective Relays


*Electronic Trip Units*

### General Description

Up to a combination of 64 INCOM trip units and protective relays may be connected to a single Power Xpert Gateway (PXG) and deployed in various power distribution and motor control applications and made accessible to an Ethernet network using the PXG.

### Equipment

- Digitrip 3000/3200
- FP-4000/5000/6000
- MP-3000/4000
- Digitrip 520MC
- IQ 500
- MPCV Relay
- Digitrip 1150/DT1150V
- Digitrip 810/910
- Digitrip MV
- Digitrip OPTIM 1050/750/550
- BIM II (Breaker Interface Module)

### Options

- PXG 400E—Up to 64 IQ meters may be connected for Web browser access and INCOM translation for Power Xpert Software
- PXG 600E/800E—Up to 96 IQ meters may be connected for Web browser access, data logging, alarm notification, control commands, and INCOM translation for Power Xpert Software

**Note:** Both PXG 400E/600E support a maximum of 64 INCOM devices while not to exceed the total PXG device limit.  
 PXG 400E—64 Total  
 PXG 600E/800E—96 Total

### Communication Interfaces

- Modbus RTU (RS-485) or INCOM downstream
- Modbus TCP/IP (with PXG)
- HTTP (with PXG) (with ECC)
- HTTPS (with PXG)
- SMTP (with PXG 600E/800E)
- SNMP (with PXG 600E/800E)
- XML/SOAP (with PXG)

### Metering/Monitoring Applications

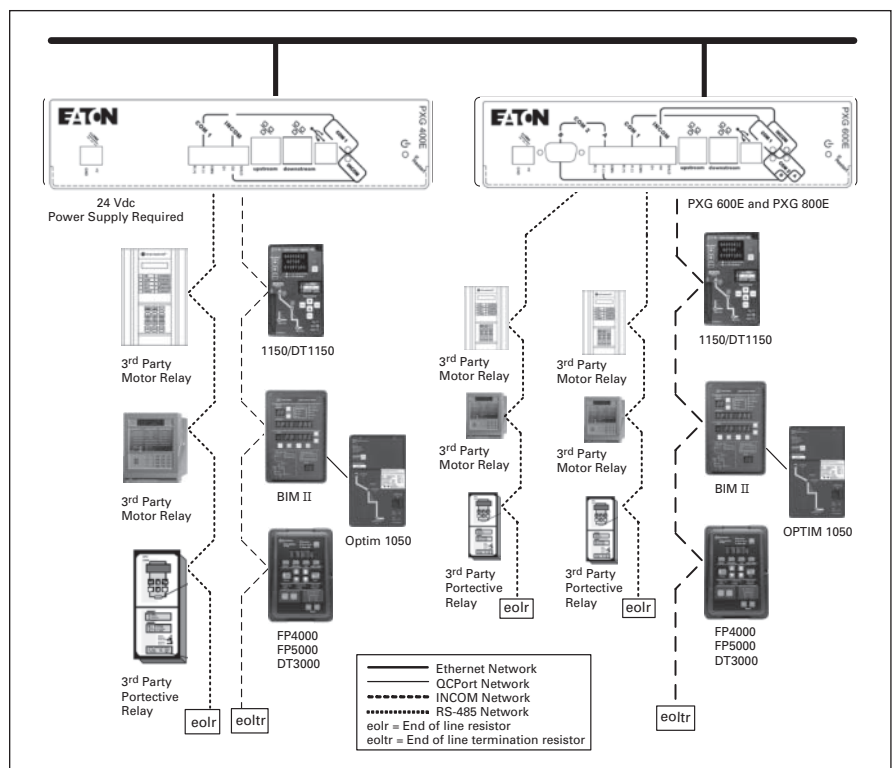
- Real-time viewing of power/energy readings (PXG)
- View trended power/energy readings (PXG 600E/800E)
- User-defined events (PXG 600E/800E)
- E-mail notification (PXG 600E/800E)

### Installation Applications

- Low voltage switchgear
- Medium voltage switchgear
- Low voltage motor control centers
- Medium voltage motor starters

### Communications Applications

- Building Management System (BMS)
- HMI
- Energy Management Systems
- Network Management Systems (NMS)
- Power Xpert Software
- Foreseer Services


*Viewing an Eaton FP-5000 Protective Relay through the Power Xpert Gateway*

**Figure 2.1-13. Power Xpert Gateway Trip Unit and Relay Application**

**Note:** When using Modbus RTU over an RS-485 communications network, the data rate, data protocol (data bit, stop bit and parity) and wiring topology (two-wire or four-wire) must be the same for each of the devices.

**Note:** Many other devices supported. See complete supported device list at [www.eaton.com/pwg](http://www.eaton.com/pwg).



## Trip Units and Protective Relays

2

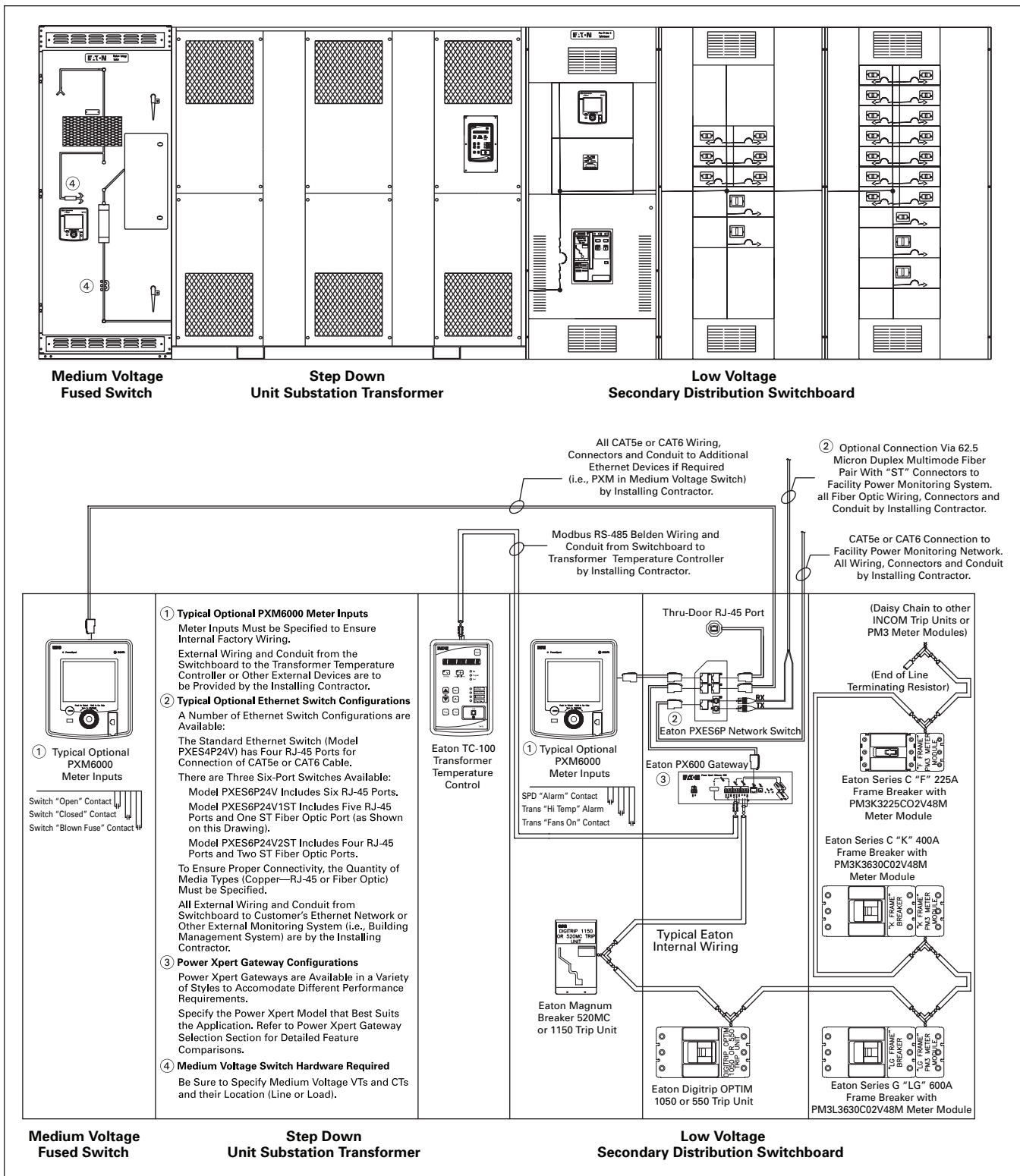


Figure 2.1-14. Typical Ethernet-Enabled Unit Substation With Switchboard Secondary



## Ethernet-Enabled Motor Control Center



*Electronic Motor Overload Relays, Soft Starters and Variable Frequency Drives*

### General Description

Eaton Variable Frequency Drives may be connected to a single Power Xpert Gateway (PXG) 400E (not to exceed 64 total) or Power Xpert Gateway 600E/800E (not to exceed 96 total) deployed in various low-voltage motor control center applications and made accessible to an Ethernet network.

### Equipment

- S811 Soft Starter
- SVX9000/MVX9000 variable frequency drives
- C441 Overload Relay

### Options

- PXG 400E—Up to 64 IQ meters may be connected for Web browser access and INCOM translation for Power Xpert Software
- PXG 600E/800E—Up to 96 IQ meters may be connected for Web browser access, data logging, alarm notification, control commands and INCOM translation for Power Xpert Software

**Note:** Both PXG 400/600 support a maximum of 64 INCOM devices while not to exceed the total PXG device limit.  
PXG 400E—64 total  
PXG 600E/800E—96 total

### Communication Interfaces

- Modbus RTU (RS-485) or INCOM (FSK)
- Modbus TCP/IP (with PXG)
- HTTP (with PXG)
- HTTPS (with PXG)
- XML/SOAP (with PXG)
- SMTP (with PXG 600E/800E)
- SNMP (with PXG 600E/800E)

### Metering/Monitoring Applications

- Real-time viewing of power/energy readings (PXG)
- View trended power/energy readings (PXG 600E/800E)
- User-defined events (PXG 600E/800E)
- E-mail notification (PXG 600E/800E)

### Installation Applications

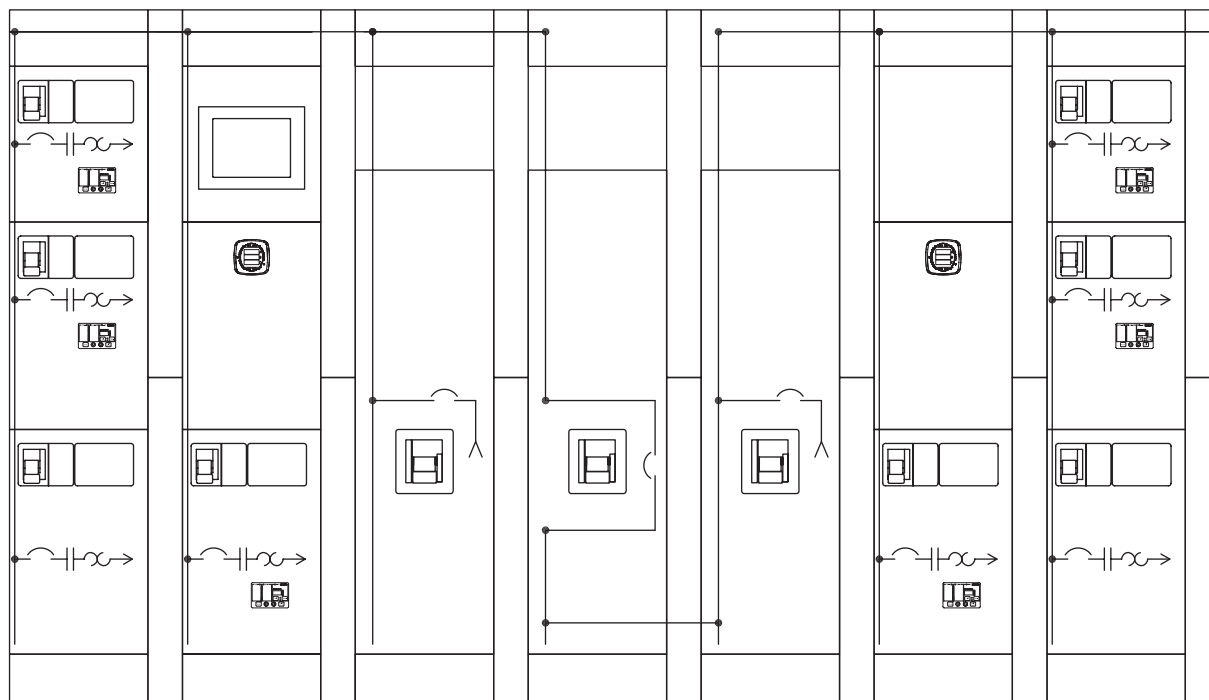
- Low voltage switchgear
- Medium voltage switchgear
- Low voltage motor control centers
- Medium voltage motor starters

### Communications Applications

- Building Management System (BMS)
- Energy Management Systems
- Network Management Systems (NMS)
- HMI
- Power Xpert Software
- Foreseer Services

### Trip Units and Protective Relays

2



All CAT5e or CAT6 Wiring, Connectors and Conduit to Additional Ethernet Devices if Required (i.e., Other Ethernet Communicating MCCs) by Installing Contractor.

② Optional Connection Via 62.5 Micron Duplex Multimode Fiber Pair with "ST" Connectors to Facility Power Monitoring System. All Fiber Optic Wiring, Connectors and Conduit by Installing Contractor.

CAT5e or CAT6 Connection to Facility Power Monitoring Network. All Wiring, Connectors and Conduit by Installing Contractor.

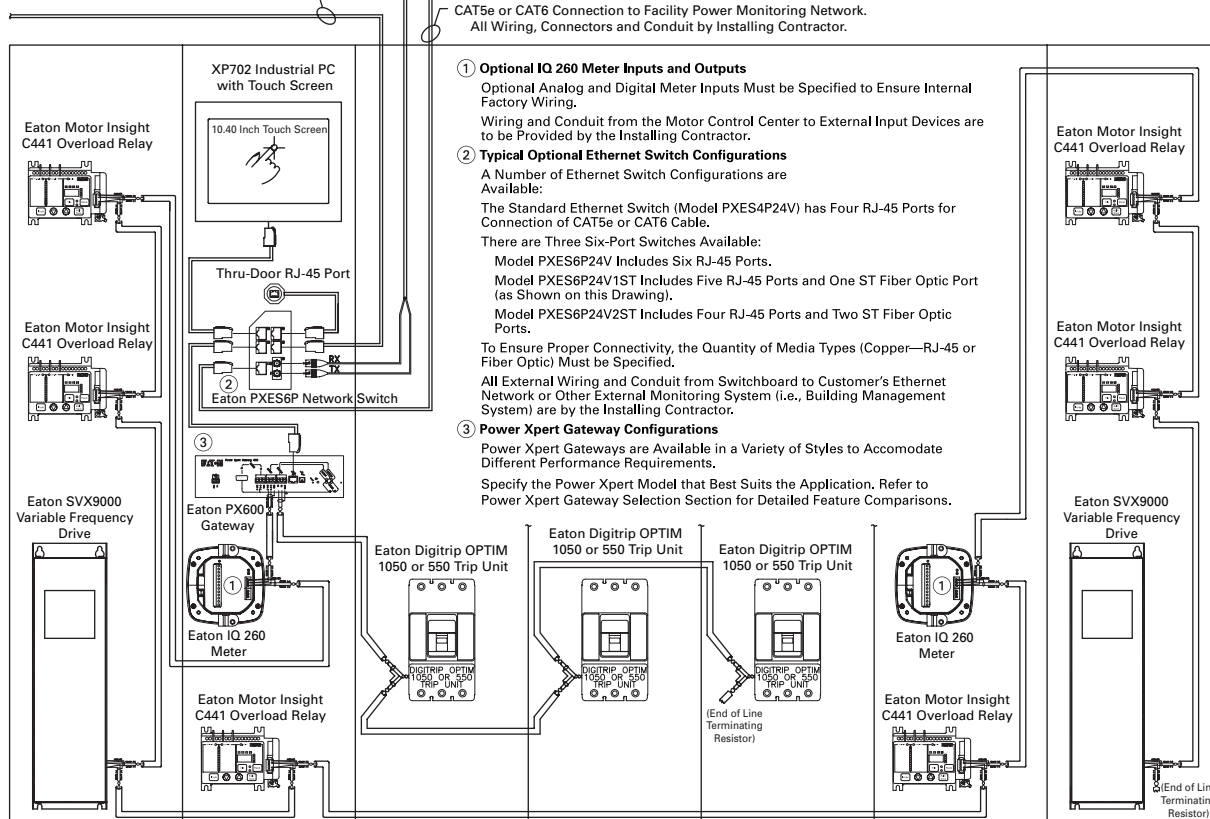


Figure 2.1-15. Typical Ethernet-Enabled Motor Control Center

## IPONI Communication Modules

## IPONI Communication Modules

Metered Parameters/  
Communications

An IPONI enables communication of the metered parameters and set points consistent with those of the device to which it is attached.

## Physical Characteristics

Each IPONI attaches to its associated product. No other mounting or enclosure is required. When mounted to the back of the meter or relay or other communicating device, the IPONI gets its power from the device to which it is attached. The connection to the device is via a 9-Pin connector.

## Certifications/Listings

- IPONI: UL/cUL®

## Communications

The IPONI enables communications over a twisted shielded pair INCOM device network. Wiring communications to these devices adhere to the Wiring Guidelines (see **Pages 2.1-15 and 2.1-17**).



IPONI Communication Module

## Supported Devices

- IQ Analyzer ( $\geq 1.06$ )
- IQ DP-4000
- Automatic Transfer Control (ATC)
- BIMII
- MP-3000
- MP-4000

## Catalog Information

Table 2.1-11. PONI Communication Modules

Description	Catalog Number
INCOM PONI	IPONI

## Breaker Interface Module (BIMII)

## Breaker Interface Module



Breaker Interface Module

## General Description

Eaton's Breaker Interface Module is a panel-mounted device which performs the following functions:

- Monitors and displays parameters (right) from any combination of Digitrip RMS 810, 910, Digitrip 1150 when set up to communicate as a 910 and Digitrip OPTIM Trip Units, Energy Sentinels and Power Sentinels, supporting as many as 50 of these devices up to 10,000 ft (3048m) away
- Communicates the information from these protective and energy monitoring devices over an Eaton INCOM network
- Continuously monitors breaker's recording and time stamping trip events along with approximate fault currents. Events are logged into non-volatile RAM

## Parameters Displayed

- Phase current
- Energy
- Present demand watts
- Peak demand watts
- Average demand current
- Cause and magnitude of trip
- Trip history
- % Total Harmonic Distortion (THD) for each phase
- % Harmonic Content for each phase (1st-27th harmonic)
- Custom circuit description

**Note:** The Breaker Interface Module displays only a portion of the information it receives from the Digitrip RMS 910 and Power Sentinels. The balance of the information (such as waveform analysis and power factor) can be passed through the unit to a master computer, where it can be viewed.

## Features and Functions

## Communications

A PONI card can be easily field-mounted to the back of the Breaker Interface Module, enabling the unit to pass the information from its subnetwork to a remote master control unit up to 10,000 ft (3048m) away. No reprogramming of the unit is required when the IPONI is added.

The Breaker Interface Module can be mounted directly on the assembly or at a remote location and can be used to access, configure and display information from OPTIM trip units.

An operator can use the Breaker Interface Module to:

- Complete initial system setup:
  - Select system frequency (50/60 Hz)
  - Set password
- Configure the system:
  - Change time-current set points for Digitrip OPTIM breakers
  - Select protection options
  - Select alarm levels
- Display information:
  - Breaker information
  - Time-current set points
  - Metered values
  - Trip event information
- Test trip unit performance:
  - Phase and ground
  - Trip/no trip
- Expanded energy monitoring:
  - Set addresses for group energy monitoring
  - Group energy readings
- Local and remote indication:
  - Remote indication/alarming
  - Breaker status LED indication
- Expanded communications. Communicate with:
  - OPTIM Trip Units
  - Digitrip RMS 810 and 910
  - Digitrip 1150, 1150+ and 520MC
  - IQ Energy Sentinels
  - IQ Power Sentinel
  - A total of 50 devices

## Password Protection

A user-defined password is included for added security when changing settings or performing breaker tests.

## Non-Volatile Memory

The programmed functions, addresses and circuit descriptions are stored in non-volatile memory.

## External Power

A 24 Vdc supply is required for the BIMII. (No external power supply is required for the PONI Card.) A 120 or 240 Vac supply is required for the BIMPS.

## Rear Access Area

All wiring connections to the breaker interface module are made at the chassis' rear and include:

- Relay connection for "alarm" condition, "high load" condition, "peak exceed" for device or group, and wathour pulse
- Initiator
- 24 Vdc input—BIMII
- 120 or 240 Vac input—BIMPSII
- DIP switches for selecting an operating mode
- Three-contact connector with subnetwork
- Connector for PONI card for remote communications local display units

## Technical Data and Specifications

## Power Requirement

- 15 VA maximum

## Input Voltage

- 24 Vdc  $\pm 5\%$ —BIMII
- 120 or 240 Vac  $\pm 10\%$ —BIMPSII

## Operating Temperature

- 0° to 70°C (32° to 158°F)

## Humidity

- 5% to 95% R.H. (noncondensing)

## Alarm Contact Ratings

- 10 A at 277 Vac (resistive)
- 10 A at 30 Vdc (resistive)
- 1/3 hp at 125, 250 Vac

## Dimensions in Inches (mm)

- 6.72 H x 10.25 W x 2.60 D (170.7 H x 260.4 W x 66.0 D)
- 6.72 H x 10.25 W x 3.85 D (170.7 H x 260.4 W x 97.8 D) (with communications card)

Table 2.1-12. Catalog Information

Description	Catalog Number
Breaker interface module	BIMII
Breaker interface module—power supply	BIMPSII

## Digital Input Module (DIM)

## I/O Devices Digital Input Module (DIM)



Digital Input Module (DIM)

## General Description

Eaton's Digital Input Module is a device that interfaces with up to four standard utility (electric, gas, water) meters or monitors eight digital inputs. It translates KYZ pulses from meters into a register count that is maintained and compiled within the DIM module in non-volatile memory. The pulse count can be accessed from the DIM module remotely using Eaton's Power Management Software including the energy billing application.

The DIM can also be used to monitor eight digital inputs from switch closures.

## Physical Characteristics

- Height: 4.25 inches (107.9 mm)
- Width: 3.54 inches (90.0 mm)
- Depth: 3.50 inches (88.9 mm) (does include DIN rail)
- 10 LED status indicators, 100 ohm termination DIP switch, address selector switches
- DIN rail mounting

## Features and Functions

- Reads four separate KYZ equipped utility meters
- Pulse counts stored in non-volatile memory
- Each channel independently monitors KYZ counts, pulse counts, or digital indications
- Monitors a maximum of eight individual digital inputs
- Input channels are isolated
- Isolated 24 Vdc power is provided on the I/O connector
- LED indicators on the input channels indicate when the unit is counting

## Standards and Certifications

- UL 873
- CE mark (48 Vdc operation)
- FCC Part 15, Class A
- IEC 1000-4-x
- CISPR 22, Class A
- IEC 1000-4-2; 1995, Electro Static Discharge
- IEC 1000-4-3; 1995, Radiated RFImmunity.
- IEC 1000-4-6; 1996, Conducted RFImmunity
- FCC Part 15 Class A (10 meters) Radiated Emissions
- CISPR 22, Class A (30 meters); 1991, Radiated Emissions
- CISPR 22, Class A; 1991, Conducted Emissions (PowerPort)

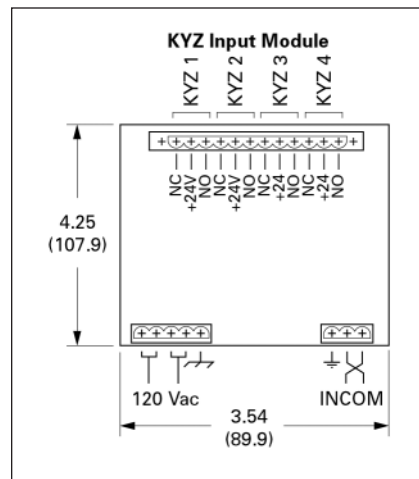


Figure 2.1-16. KYZ Input Module

## Technical Data and Specifications

## Frequency Range

- 50/60 Hz

## Power

- 85 to 138 Vac (120 Vac nominal) 50/60 Hz; 100 mA
- 48–128 Vdc (48 Vdc nominal); 100 mA
- Brownout operation at 50% and 80% of nominal ac and dc ratings
- Power input is provided from a limited source, isolated from the mains by double isolation
- Power for all inputs is supplied from an internal, isolated 24 Vdc power source

Table 2.1-13. Specifications

Description	Rating
Operating temperature	–20° to 60°C
Storage temperature	–20° to 70°C
Operating humidity	5 to 90% maximum noncondensing
Altitude	10,000 ft (3048m)
Environment	Indoor use only
Transient overvoltage	Category 2
Pollution	1°
Equipment	Class 1

## Mounting Information

The DIM module is designed to be DIN rail mountable. DIN rail must be 1/3 inches H x 1-3/8 inches W (8.5 mm H x 34.9 mm W).

## Communications

The DIM is a fully compatible Power Management Software communicating device with built-in INCOM communications. The DIM comes complete with a 3-pin connector to receive the shielded twisted pair conductor.

All wiring must be complete as per Instruction Leaflet TD17513, wiring specification base rules.

Table 2.1-14. Ordering Information

Description	Catalog Number
Digital input module	DIM

## Addressable Relay II

2

## Addressable Relay II



Addressable Relay II

## General Description

Eaton's Addressable Relay II is designed for use where information or control of non-communicating devices is required remotely. The relays communicate INCOM Frequency Shift Key (FSK) on the Power Management Software system. Devices are assigned a 3-digit address to uniquely identify them on the daisy-chained twisted shielded pair network.

The Addressable Relay II is a Form C relay with output contact ratings as shown in the specifications table. The Addressable Relay II may be powered by 48–120 Vac or 48–125 Vdc through terminals 11 and 12 of the terminal block. dc polarity is not significant. The operating temperature range of the Addressable Relay II is 0° to 70°C.

Each Addressable Relay II includes two status indicating circuits (IN1 and IN2) that can be used to transmit the contact status of devices external to the Addressable Relay II. A typical installation using these report-back inputs to the Power Management Software system is shown in the wiring example. Terminals 4 and 5 connect to the status input 1 circuit, and terminals 6 and 7 connect to the status input 2 circuit. These status indicating circuits operate with input voltages of 48–120 Vac or 48–125 Vdc circuits. The Addressable Relay II includes a feature called the "communications watchdog." The communications watchdog monitors communications between the Addressable Relay II and the computer control station. If communications are lost, the communications watchdog will reset the relay to the de-energized (OFF) state.

The Addressable Relay II must be updated every 10 seconds when the communications watchdog is enabled or else communications are assumed to be lost. The communications watchdog is enabled when DIP switch 3 is set to the ON position. When the communications watchdog is not enabled, the relay will remain in the state set by the last command issued. See **Figure 2.1-17** for DIP switch configuration.

## Physical Characteristics

- Height: 3.00 inches (76.2 mm)
- Width: 1.75 inches (44.5 mm)
- Depth: 4.00 inches (101.6 mm)

## Features and Functions

- Enables remote control of non-communication capable devices on the Power Management Software system

- Monitors two digital status inputs on the Power Management Software system

## Monitored Parameters

- Output relay energized/de-energized
- Input relay 1 status
- Input relay 2 status
- Breaker status open/closed
- Protective relay status normal/tripped

## Communications

- Built-in INCOM communications for monitoring in a Power Management Software system

Table 2.1-15. Ordering Information

Description	Catalog Number
Addressable relay	ARII

	OFF	ON
Baud Rate	9600	1200
Relay Pulse	Disabled	Enabled
Communications Watchdog	Disabled	Enabled

Figure 2.1-17. DIP Switch Functions

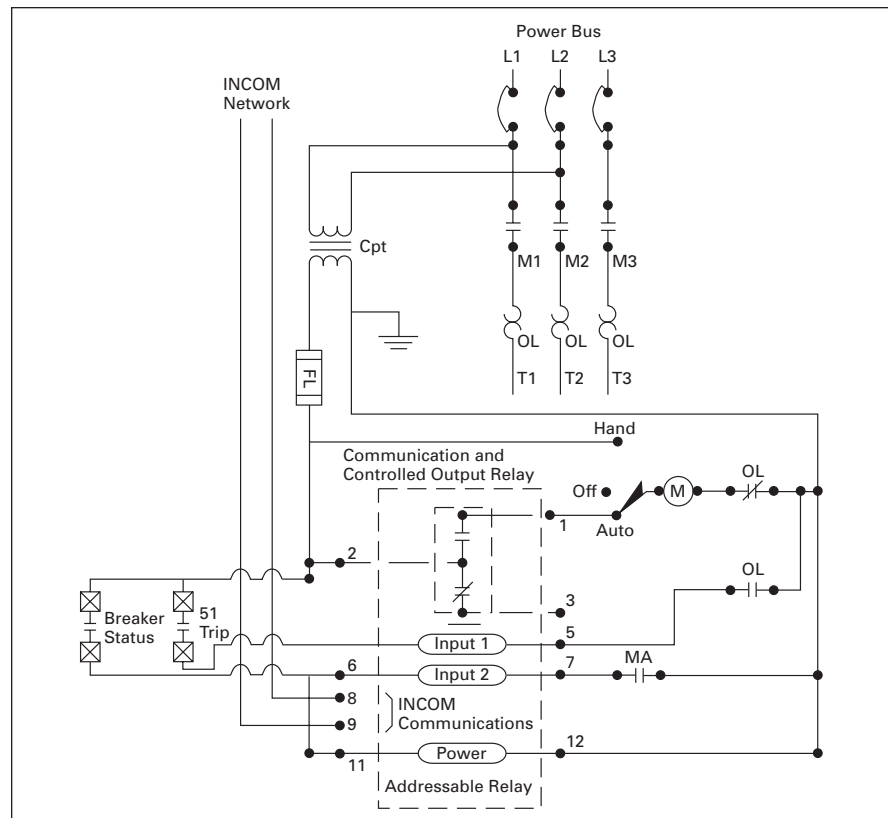


Figure 2.1-18. Typical Addressable Relay II Wiring Diagram

Note: The Power Xpert Gateway does not support the Addressable Relay II.



## Power Xpert Ethernet Switches



*Convenient Network Expansion*

### General Description

Eaton's Power Xpert Ethernet switches are ideal for extending Ethernet networks via CAT5 wiring or fiber in harsh, industrial environments. Built with high-grade components and constructed using special thermal techniques, PXE switches can withstand the unpredictable conditions of such environments.

### Features

- Simultaneous, full-duplex, high-speed communication on all ports—no network performance bottlenecks
- Hardened for factory floor—ideal for both industrial or data center applications
- Unmanaged, plug-and-play implementation—no software or additional hardware required for configuration
- Seamlessly integrates into Eaton's Power Xpert Architecture—quality and reliability of Eaton guaranteed
- Mounting options include stand-alone panel-mounting, DIN rail mounting, or 19-inch standard rack mounting

#### PXE 6-Port Switch—10/100 Mb with Optional 100 Mb Fiber

This compact switch provides six Ethernet ports, with flexible configurations. The base models have one of three options:

- Two 100 Mb fiber and four 10/100 copper ports
- One fiber and five copper ports
- Six copper ports

#### PXE 4-Port Switch—10/100 Mb

For smaller applications requiring fewer connection points and no fiber, the 4-port Power Xpert Ethernet switch is a versatile option. It provides edge access Ethernet ports in a convenient and compact package.

## Technical Data and Specifications

**Table 2.2-1. Power Xpert Ethernet Switches**

Description	Catalog Number
4 port Ethernet switch—copper only	PXES4P24V
6 port Ethernet switch—copper only	PXES6P24V
6 port Ethernet switch—5 copper/1 fiber (ST connector)	PXES6P24V1ST
6 port Ethernet switch—4 copper/2 fiber (ST connector)	PXES6P24V2ST

**Table 2.2-2. Accessories**

Description	Catalog Number
Power supply (preferred)—100–240 Vac input DIN rail mount with screw—24 Vdc output terminals	ELC-PS02
Power supply (alternate)—120 Vac input Wall plug-in type with 6 ft. cord—12 Vdc output	PXESPS12V
DIN rail mounting bracket	PXESDINRL
19-inch rack mount tray	PXESTRAY

**Table 2.2-3. Operating Environment**

Description	Specifications
Ambient temperature ratings	–25° to 60°C long-term per independent agency tests (UL), or –40° to 85°C short-term per IEC type tests
Storage temperature	–40° to 185°F (–40°C to 85°C)
Cold start	to –20°C
Ambient relative humidity	5%–95% (noncondensing)
Altitude	–200 to 50,000 ft (–60 to 15,000m)
MTBF	> 15 years

**Table 2.2-4. Network Standards**

Description
Ethernet IEEE 802.3, IEEE 802.3u; IEEE 802.1p, 100Base-TX, 10Base-T, 100Base-FX

**Table 2.2-5. Agency Approvals and Standards Compliance**

Description
UL listed (UL60950), cUL, CE, emissions meet FCC Part 15, Class A

**Table 2.2-6. Power Consumption**

Description
7.0 watts typical—9 watts maximum

**Table 2.2-7. Packaging**

Description	Specifications
Enclosure	Robust sheet metal (steel)
Dimensions of PXES4P series	3.50 in H x 3.00 in W x 1.00 in D (8.9 cm x 7.6 cm x 2.5 cm)
Weight of PXES4P series	8.6 oz. (243g)
Dimensions of PXES6P series	3.60 in H x 3.00 in W x 1.70 in D (9.2 cm x 7.6 cm x 4.3 cm)
Weight of PXES6P series	13 oz. (370g)
Cooling method	Case used as a heat sink

**Table 2.2-8. Mounting**

Description	Specifications
Metal panel mounting clips	Included
DIN rail mounting	Optional
19-inch rack mount	Optional

**Note:** These specifications are subject to change without notice and represent the maximum capabilities of the product with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options and product model. Please refer to the technical data sheet and user manual for detailed specifications. Please see [www.eaton.com/powerxpert](http://www.eaton.com/powerxpert) for latest information.

## Application Information

2

## Copper Ethernet Cable Wiring Guidelines

The following information can be used as a guide when designing an Ethernet system using copper Ethernet cable.

- Cables should not be routed near equipment that generates strong electric or magnetic fields such as motors, drive controllers, arc welders and conduit
- Ethernet cable insulation has a voltage rating of 300 Vac. Use of barriers, cable trays or high voltage sheathing with STP Ethernet cable may be required in installations with cables carrying voltages greater than 300 Vac. This may also be necessary in order to comply with UL requirements. In installations where the cable cannot be physically separated from the power cables (where a physical barrier is not practical) fiber optic cable should be used
- When crossing power conductors with Ethernet cable, cross at right angles
- Shielded twisted pair (STP) Ethernet cable should be specified for use in high noise environments. Shielded shrouded connectors must be used and the shield must be connected at both ends of the wire. The mating plug must have a shielded shroud that is terminated to ground at both ends. Where there is a possibility of a difference in ground potential (common mode) voltages between the two terminated ends, fiber optic cable is recommended
- When using conduit or a metal cable tray, each section of the conduit or tray must be bonded to each adjacent section and the conduit or tray needs to be bonded to earth ground. Do not allow the shields to touch the conduit or metal tray at any point
- Only shielded (STP) Ethernet cables should be placed into metal conduit. Some UTP cables may not function properly when installed in conduit, as the metal conduit can affect the electrical properties of an unshielded cable. Consult the cable manufacturer when installing UTP cables in conduit
- As a general rule for noise protection, Ethernet Cable should maintain a minimum distance of 3 inches (8 cm) from electric power conductors for up to 100V and 1 inch (3 cm) for each additional 100V up to 400V. STP cable is recommended
  - For Ethernet cable run within conduit but near conductors with potentially noisy power conductors carrying currents of greater than 20A or voltages greater than 400V, maintain the following distances. STP cable is required
    - Conductors of less than 20A = 3 inches
    - Conductors of 20A or more and up to 100 kVA = 6 inches
    - Conductors greater than 100 kVA = 12 inches
  - For Ethernet cable run near conductors with potentially noisy power conductors carrying currents of greater than 20A or voltages greater than 400V, maintain the following distances. STP cable is recommended
    - Conductors of less than 20A = 6 inches
    - Conductors of 20 A or more and up to 100 kVA = 12 inches
    - Conductors greater than 100 kVA = 24 inches
- Route Ethernet cable at least 5 ft (1.5m) from sources of rf/microwave radiation. STP cable is required
- Do not cascade more than four Ethernet repeaters (router, switch or hub) within a network segment
- Environmentally sealed connectors should be specified for cables used in outdoor installations
- Avoid pinching the cable when using cable ties
- Total distance between an Ethernet transmitter and receiver at the end points of the network should not exceed 328 ft (100m)
- Total distance from a patch panel to a wall jack (using solid cable) shall not exceed 295 ft (90m). Splices are not permitted
- Patch cords used as cross-connect jumpers in a patch panel should not exceed 20 ft (6m)
- Patch cords from a wall jack to the work area PC (or device) shall not exceed 16 ft (5m)
- Ethernet cable used in harsh environments must be selected to withstand the following conditions: vibration, air born contaminants, chemicals, temperature, electro-magnetic interference, combustible atmospheres and local regulatory standards such as UL and NEMA

- Ethernet connectors used in harsh environments must be robust enough to withstand vibration, multiple connection cycles, temperature changes, and provide a proper seal to protect against moisture, dust/dirt and chemical attack
- Different cable media support different bandwidth capabilities. When installing cable in a network, care should be taken to install the cable that will fill current network loading requirements and future expansion needs. In general, fiber optic cable can support the greatest bandwidth (upward of 25,000 gigabits) and UTP has the lowest. CAT5e cabling is designed to operate at bit rates up to 1000 Mb and CAT6 cable up to 2000 Mb
- Operating your cable at maximum speed reduces the distance between network segments. Check with your cable supplier for specifications regarding segment distance vs. speed
- Cable with 5% impedance mismatch or return loss of 27 to 32 dB is recommended. Ethernet cable impedance can vary by as much as 15% (85 to 115 ohms). Average Ethernet cable with 15% impedance variation can have up to 10 dB additional return loss. This discontinuity is referred to as return loss, since it causes some of the signal to be reflected back down the cable instead of propagating forward. It is measured in decibels or ratio of transmitted versus reflected signal

## Fiber Optic Technology

The use of fiber optics in telecommunications and wide area networking has been common for many years, but more recently fiber optics have become increasingly prevalent in industrial data communications systems as well. High data rate capabilities, noise rejection and electrical isolation are just a few of the important characteristics that make fiber optic technology ideal for use in industrial and commercial systems.

Although often used for point-to-point connections, fiber optic links are being used to extend the distance limitations of RS-232, RS-422/485 and Ethernet systems while ensuring high data rates and minimizing electrical interference.

Conventional electrical data signals are converted into a modulated light beam, introduced into the fiber and transported via a very small diameter glass or plastic fiber to a receiver that converts the light back into electrical signals.

Optical fibers allow data signals to propagate through them by ensuring that the light signal enters the fiber at an angle greater than the critical angle of the interface between two types of glass. Optical fiber is actually made up of three parts. The center core is composed of very pure glass. Core dimensions are usually in the range of 50–125  $\mu\text{m}$  for multi-mode cables and 8–9  $\mu\text{m}$  for single-mode cables. The surrounding glass, called cladding, is a slightly less pure glass. The diameter of the core and cladding together is in the range of 125–440  $\mu\text{m}$ .

Surrounding the cladding is a protective layer of flexible silicone called the sheath.

## Fiber Optic Cable Wiring Guidelines

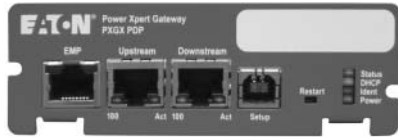
The following information can be used as a guide when designing an Ethernet system using fiber optic Ethernet cable:

- Select a fiber cable that is suited for the application, e.g., outdoor, aerial, duct, intra-building, risers, general building and plenum applications
- Fiber optic cable is useful in applications where the environment is combustible, electrically noisy, the cable must be bundles with high voltage wires or where common mode voltages may exist between the earth ground points of the terminating connectors
- Fiber optic cable is available in various operating temperature ranges. Care should be taken to match the temperature rating of the fiber to the environment it will be exposed to. The temperature specification for fiber may be narrower than copper cable. Consult the cable manufacturer for temperature specifications of your cable type
- Sealed fiber connectors are available for use in harsh environments to prevent contamination from entering the connector and fiber. The type of seal required will be application dependant and can vary from dust- and moisture-proof to water-tight
- Mixing fiber cable types is not permitted. The same core dimensions and mode must be used within cable segments
- Care should be taken when purchasing connectors to include strain relief, which reduces mechanical strain (vibration) within the cable, as well as the connector. Strain relief also provides support to the cable to ensure proper bend radius at the connector
- Single-mode fiber is used for long distance transmission of up to 120 km. Distance may vary depending on speed and type of converter used
- Multi-mode graded-index fiber cable is used for communication over shorter distances of up to 2 km
- Fiber cable is composed of glass and is not well suited for applications requiring tight bend radiuses. Cable radius dimensions vary per manufacturer. If the manufacturer does not provide a bend radius, a typical rule of thumb is a radius not less than 15x the cable diameter
- Fiber cable to connector terminations can be performed in the field using special equipment. This method is not recommended
  - Tier One testing is recommended when diagnosing system irregularities and should be performed in all new installations
  - Tier Two testing is recommended to certify that a system complies with standards set forth by the owner/installer

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## Power Xpert Gateway PDP Card—Power Distribution Unit



*Power Xpert Gateway PDP Card*

### General Description

The Power Xpert Gateway Power Distribution Products Card (PXGX PDP) provides Web-enabled, real-time monitoring of Powerware Power Distribution Units (PDUs), Rack Power Modules (RPM) and Powerware Remote Power Panels (RPPs) through standard on-board Web pages, Power Xpert Software or third-party software.

An integral part of the Power Xpert Architecture, which provides end-to-end PowerChain™ solutions, the PXGX PDP provides a central point to connect distribution products to an Ethernet network.

Information is presented in organized, user-friendly Web pages and include the following:

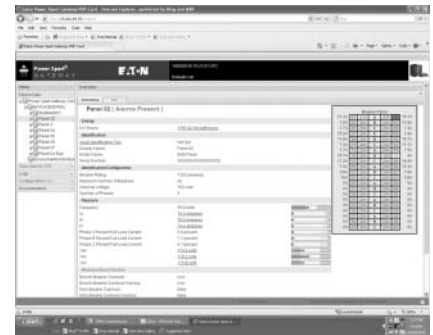
- PDU system identification
- Graphic panel layouts
- Voltage
- Current
- Frequency
- Energy
- Power
- THD (current and voltage)

### Features

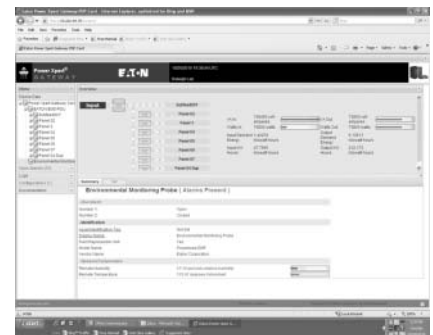
- Web-enabled monitoring of power quality data down to the branch circuit level—data can be viewed from any location with a Web browser
- Configure and edit the EMS remotely via the Web interface—supports remote configuration, including naming, alarm and warning set points, and percentages
- Data and event logging with time stamp—accurate logging for power quality analysis
- Modbus TCP/IP and SNMP support—open communication protocol facilitates integration with standard building management systems and network management systems
- Customized e-mail messaging for events notification, including data and event logs and periodic “heart-beat” e-mails—direct alarm and event notification to the appropriate person(s) in the organization
- Easy integration into existing Ethernet infrastructure—minimize installation cost
- Securely access and view information—password authentication is required at two levels. The card also supports secure Web-based communication via SSL
- Generate Modbus register maps on the fly—all of the data specific to the system is immediately available and can be generated with one click of the mouse
- Save and Restore settings—Configuring a large PDU with EMS can take time. Once the effort is complete, the configuration can be saved for later use. It also allows the user to duplicate panel identical configurations in minimal time
- Supports the environmental monitoring probe—temperature, humidity and contact status can be viewed through the Web page



*PDU or RPP System Summary Page*



*PDU or RPP Panel Page*



*EMP Page*

### Technical Data and Specifications

## Technical Data and Specifications

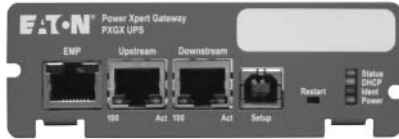
**Table 2.3-1. The Power Xpert Gateway PDP Card Kit**

Power Xpert Gateway PDP Card	
Local configuration Cable	
Quick Start guide	
<b>Ordering Information</b>	
Catalog number	PXGXDPDP
Style number	103008064-5591
Description	Power Xpert Gateway PDP Card for use with Powerware PDUs/RPPs/RPMs/PDRs/EMS-UGK
<b>Devices Supported</b>	
Eaton Power Distribution Units with X-Slot compatibility	
Eaton Remote Power Panels with X-Slot compatibility	
Eaton Rack Power Modules with X-Slot compatibility	
Eaton Power Distribution Rack with X-Slot compatibility	
Eaton Energy Management System with X-Slot compatibility	
<b>Communication Ports</b>	
Ethernet ports	Two RJ-45 ports: supports 10/100Base-T for daisy chaining via integrated Ethernet switch
Serial ports	One USB port: supports local configuration and one RJ485 for optional connection to an Environmental Monitoring Probe (EMP)
<b>Communication Protocols Supported</b>	
Web server	Supports data access from Web browsers (HTTP and HTTPS)
Modbus TCP/IP	Supports data access from Modbus TCP clients
SNMP	Supports common network management tools
SMTP	Supports e-mail notification
NTP	Supports time synchronization via an NTP server for card and PDU synchronization
DHCP	Supports automatic IP address assignments, if enabled
BACNET IP	Supports data access from BACnet/IP clients
<b>Supported MIBs</b>	
Eaton PDU MIB	
Eaton EMP MIB	
Eaton alarms and traps MIB	
RFC 4133 entity MIB	
RFC 4268 entity state MIB	
RFC 4268 entity state MIB Part II	
RFC 1213 MIB II	
<b>Web Browsers Supported</b>	
IE, 7 and 8	
Mozilla Firefox, 2.0 and higher	
Google Chrome	
<b>Physical Characteristics</b>	
Dimensions	12 cm x 11.4 cm x 3.9 cm (4.70 in x 4.50 in x 1.50 in)
Weight	200g (7.0 oz)
<b>Environmental Specifications</b>	
Ambient operating	0° to +40°C (32° to 104°F)
Relative humidity	10 to 80%, noncondensing
Altitude	10,000 ft
Enclosure rating	Indoor use only
<b>Mounting Configuration</b>	
X-Slot form factor fits directly into PDU/RPP/RPM chassis/PDR/EMS-UGK	
<b>Power Supply</b>	
Nominal input voltage	12 Vdc, unregulated (provided by PDU/RPP)
Input voltage range	8–25 Vdc, unregulated
<b>Power Consumption</b>	
3.5 watts	
<b>Regulatory/Standards Compliance</b>	
FCC Part 15, Class A	
CISPR 22, Class A	
ROHS Compliant	
Telecom conducted via EU standard	EN 55022:1988+A1:2000+A2:2003, Class A/EN55022:1988+A1:2000+A2:2003

**Note:** Features and specifications listed in this document are subject to change without notice and represent the maximum capabilities of the software and products with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options.



## Power Xpert Gateway UPS Card—Uninterruptible Power Supplies



*Power Xpert Gateway UPS Card*

### General Description

The Power Xpert Gateway UPS Card (PXGX UPS) provides Web-enabled, real-time monitoring of Powerware Uninterruptible Power Supplies (UPS) through standard on-board Web pages, Power Xpert Software or third-party software.

An integral part of the Power Xpert Architecture, which provides end-to-end PowerChain solutions, the PXGX UPS provides a central point to connect distribution products to an Ethernet network.

Information is presented in organized, user-friendly Web pages and include the following:

- UPS system identification
- Voltage
- Current
- Frequency
- Energy
- Output Power
- Power—full load %
- Battery information
  - History and maintenance
  - Run time remaining
  - Voltage
  - % battery left

### Features

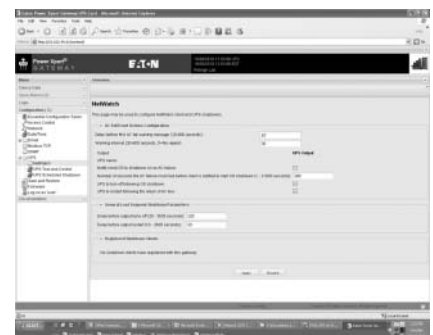
- Web-enabled monitoring of power quality data—data can be viewed from any location with a Web browser
- Data, event and system logging with time stamp—accurate logging for power quality analysis
- Modbus TCP/IP and SNMP support—open communication protocol facilitates integration with standard building management systems and network management systems
- Intelligent e-mail communications—two options for alarm and event email notification, individual emails for each alarm or event, or collective notification, providing the same information with a drastically reduced number of e-mails
- Easy integration into existing Ethernet infrastructure—minimize installation cost
- Secure access and view information—password authentication is required at two levels. The card also supports secure Web-based communication via SSL
- Generate Modbus register maps on the fly—all of the data specific to the UPS is immediately available and can be generated with one click of the mouse
- Save and Restore settings—once the configuration effort is complete, it can be saved for later use
- Supports the environmental monitoring probe—temperature, humidity and contact status can be viewed through the Web page
- Two independent, redundant Ethernet ports—designed to support high reliability systems



*UPS Summary Page*



*Alarm Summary Page*



*NetWatch Configuration Page*

### Technical Data and Specifications

## Technical Data and Specifications

**Table 2.3-2. The Power Xpert Gateway UPS Card Kit**

Power Xpert Gateway UPS Card
Local configuration cable
Quick start guide

### Ordering Information

Catalog number	PXGXUPS
Style number	103007974-5591
Description	Power Xpert Gateway UPS Card for use with Powerware UPSs

### Devices Supported

Eaton uninterruptible power supplies with X-Slot compatibility; these include the Eaton 9155, 9315, 9355, 9330, 9390, 9395, BladeUPS®
---------------------------------------------------------------------------------------------------------------------------------------

### Communication Ports

Ethernet ports	Two RJ-45 ports: supports 10/100Base-T for daisy-chaining
Serial ports	One USB port: supports local configuration and one RJ485 for optional connection to an Environmental Monitoring Probe (EMP)

### Communication Protocols Supported

Web server	Supports data access from Web browsers (HTTP and HTTPS)
Modbus TCP/IP	Supports data access from Modbus TCP clients
SNMP	Supports common network management tools
SMTP	Supports e-mail notification
NTP	Supports time synchronization via an NTP server for card and UPS synchronization
DHCP	Supports automatic IP address assignments, if enabled
BACnet/IP	Supports data access from BACnet/IP
IP v4 and v6	IP v4 and v6 compatibility

### Supported MIBs

Eaton Power MIB
RFC 1628 UPS MIB
Eaton EMP MIB
Eaton alarms and traps MIB
RFC 4133 entity MIB
RFC 4268 entity State MIB; RFC 4268 entity state MIB Part 2
RFC 1213 MIB II

### Web Browsers Supported

IE, 7 and 8
Mozilla Firefox, 2.0 and higher
Google Chrome

### Physical Characteristics

Dimensions	12 cm x 11.4 cm x 3.9 cm (4.70 in x 4.50 in x 1.50 in)
Weight	200g (7.0 oz)

### Environmental Specifications

Ambient operating	0° to +40°C (32° to 104°F)
Relative humidity	10 to 80%, noncondensing
Altitude	10,000 ft
Enclosure rating	Indoor use only

### Mounting Configuration

X-Slot form factor fits directly into UPS chassis
---------------------------------------------------

### Power Supply

Nominal input voltage	12 Vdc, unregulated (provided by UPS)
Input voltage range	8–25 Vdc, unregulated

### Power Consumption

3.5 watts
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### Regulatory/Standards Compliance

FCC Part 15, Class A	
CISPR 22, Class A	
ROHS Compliant	
Telecom conducted via EU standard	EN 55022:1988+A1:2000+A2:2003, Class A/EN55022:1988+A1:2000+A2:2003

**Note:** Features and specifications listed in this document are subject to change without notice and represent the maximum capabilities of the software and products with all options installed. This is not a complete feature list. Features and functionality may vary depending on selected options.

## Power Xpert® Software

### General Description

Power Xpert Software aggregates the information arriving from different types of device families via various communication methods. Its unique Web-based design, alarm bubble-up and advanced trend and waveform analysis tools help you to quickly turn your attention to the most important events and to identify reliability issues and cost-saving opportunities. The standard custom graphic package, the Layout Manager, with an icon library and standard vertical templates, allows you to import and mimic your physical environment and gauges. Open protocol support makes Power Xpert Software compatible with most newer generation third-party equipment. Older legacy, proprietary protocols are supported by Power Xpert Gateways (see **Page 2.1-1**), and custom software drop-in drivers made available by Eaton. Power Xpert Software is the first power system software of this caliber to put all these powerful features at your fingertips.

### Product Selection Guide

#### Power Xpert Software Professional Edition

- Geared toward end users, with built-in support for Eaton power distribution products such as switchgear, UPSs, breakers, PDUs, RPPs, meters, relays, VFDs and MCCs, among others
- Eaton products connect with the software directly via an Ethernet connection, while legacy devices use a Power Xpert Gateway to Web-enable their communications
- A subset of third-party meters and devices are supported as standard via the gateway connection

#### Power Xpert Software Enterprise Edition

- Geared toward advanced power users, system integrators and enterprises with heterogeneous device spectrum and system developers who can take advantage of the included SNMP and Modbus integration development utilities
- Extensive support for third-party devices via standard SNMP and Modbus TCP protocols
- Large variety of ready made, optional third-party drop in drivers available

### Key Features

- Connects to your existing network
- Data trending and graphing for detailed information for troubleshooting, problem prevention and costs savings
- Web-based views that allow access to critical information from any location via a Web browser
- A modular, scalable architecture that allows the addition of capabilities and devices as the power system expands
- Alarm conditions bubble up through the system to allow personnel to identify which device is in alarm and where it is located
- All the functionality of Eaton's PowerNet software suite
- Connectivity to a wide range of Eaton and third-party devices. For a full list of compatible devices, refer to the hardware compatibility list found at [www.eaton.com/pxs](http://www.eaton.com/pxs)



**Power Xpert Software Layout Manager**

The Power Xpert Software Layout Manager module provides the user a library of powerful design tools and standard templates for the creation of custom Human-Machine Interface (HMI) graphical layouts. Objects can be easily animated, various gauges can be selected, and custom bitmaps can be imported with little effort.

**Table 2.4-1. Power Xpert Software Edition Features**

Feature Sets	Power Xpert Software Professional Edition	Power Xpert Software Enterprise Edition
Server module	■	■
Trend viewer module	■	■
Layout manager module	■	■
Quality manager module	■	■
Eaton device support (switchgear, UPSs, breakers, ePDUs, meters, relays, VFDs, MCCs, etc.)	■	■
Power Xpert Gateway third-party device support	■	■
SNMP connector		■
Modbus connector		■
Optional third-party driver support		■
Custom third-party device driver support		■

**Note:** For complete listing of Foreseer class hardware compatibility, visit the Foreseer Web site at [www.eaton.com/foreseer](http://www.eaton.com/foreseer).

## Power Xpert Software

**Table 2.4-2. Power Xpert Software General Features**

Features
<b>General</b>
Web browser user interface Web-based monitoring capabilities Downloadable software version updates
<b>Event Notification</b>
Event notification via e-mail notification Event Notification via pagers, text message or third-party interfaces Alarm state management
Event indicator displayed without Web page active Alarm/event searching and filtering Waveform attached to applicable power event
Web browser based waveform viewing Alarm capabilities based on device driven events
<b>Analysis and Trending</b>
Graphic trend viewer Chart or data option selection Multiple trends display
Multiple axis support View multiple variables (i.e., Ia, Ib, Ic, Vab, Vbc, etc.) for a single waveform Standard COMTRADE file format support
Customizable trend viewer look and feel Fixed or custom time frames Trend analysis capabilities Data export
<b>Custom Graphics and Layouts</b>
Custom graphics development via Web browser Four user view example templates included as standard iFrame capability
Browser portal widget support Streaming media support Graphic object library included as standard
ISO standard electrical picture objects available Graphic files import capability Graphic object animation capability
Gauge object library support External Web Links support Alarm bubble-up support through several page layers Trend object support
<b>UPS Shutdown</b>
File saving during shutdown Automatic, orderly and sequential shutdown Parallel redundant UPS shutdown capability
<b>Security and Administration</b>
Windows authentication security Two tier secure system access support SSL Secure Web browser access (support for HTTPS)
<b>Time Synchronization</b>
Time synchronization support for connected devices with 1 millisecond time resolution
<b>Export and Integration</b>
Extended Excel spreadsheet support SQL database query support
<b>Logs</b>
System log Error log
<b>Service</b>
Eaton help desk services (1-877-ETN-CARE) Turnkey startup service
<b>System Backup</b>
Power Xpert Software system backup
<b>Documentation and Training Videos</b>
System Administrator's Guide Power Xpert Software User's Guide Layout Manager Guide
Quick Start Guide Power Xpert Software introduction and training video Power Xpert Reporting introduction and training video

## Analyzing Power Quality

Electrical power quality is becoming ever more important with the continuing increase of nonlinear loads in industrial and commercial facilities. Voltage or frequency variances can disrupt many industrial processes, resulting in costly downtime and equipment losses. Power Xpert Software provides historical profiles, or records of events for internal and utility verification, as well as real-time information that allows the user to isolate the source, magnitude, time and direction of power quality problems, including the following:

### ■ Voltage Disturbances

The most common power quality problem, voltage sags and swells, occurs because of utility supply variations, system faults or the concurrent starting of large motor loads

### ■ Harmonics

Harmonic distortion appears on the distribution system because of variable frequency drives and other non-sinusoidal loads where AC/DC conversion is present (UPS systems, computer power supplies, etc.)

### ■ Power Factor

The ability to monitor power factor throughout the facility ensures delivery of power at optimal efficiency, allows 100% usage of transformers and prevents costly power factor penalties

## Managing Energy Costs

Energy management is essential for an industrial or commercial facility. Electricity costs account for between 10 and 30% of total facility operating costs. Despite being often considered overhead, energy costs are manageable.

### Manage When Energy is Used

Manage your energy costs by accurately measuring and quantifying energy patterns and usage within the facility.

### ■ Track Use Patterns

Efficiently schedule processes during non-peak usage times by being able to identify where and when energy is being consumed. Verify the effectiveness of energy reduction methods

### ■ Purchase Energy

Make informed energy purchasing decisions by comparing how the rate structures offered by various suppliers impact your bottom-line

## ■ Allocate Energy Costs

Establish accountability and enable incentives for energy conservation by accurately allocating usage and costs to each process or department

## ■ Verify Energy Bill

Confirm the accuracy of your energy bill using the detailed data supplied by Power Xpert Software

## Track and Schedule Maintenance

Coordination problems can be identified by overlaying coordination curves of active devices identifying problems before an unnecessary outage occurs. Maintenance schedules can be created on real-time mechanical and electrical equipment usage avoiding unnecessary preventive maintenance. Equipment benefiting from usage-based maintenance can have maintenance alarms initiated based on equipment lifetime deteriorators rather than simply time schedules.

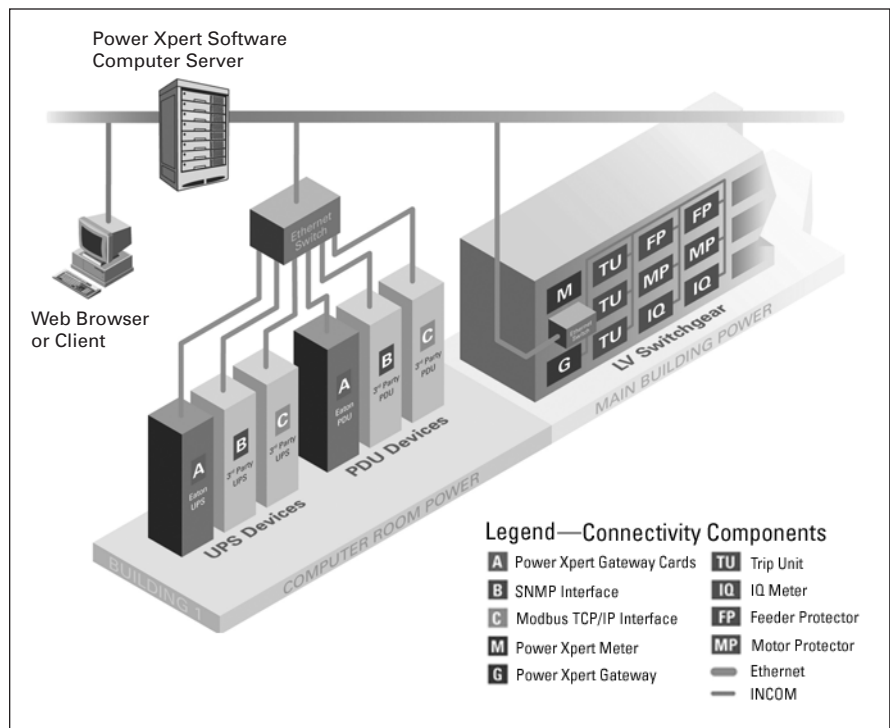


Figure 2.4-1. Typical Power Xpert Software System



## Problem Avoidance and Troubleshooting

Operators receive alerts to potential problems before they occur, such as a breaker timing out to trip. Loads can be shed or switched to alternate sources to prevent critical upstream breakers from unnecessarily tripping on an overload condition. Crucial electrical distribution information is instantaneously available to identify which breaker has tripped along with the cause and magnitude of the problem. Event sequence information narrows the list of possible causes to a trip. Immediate identification of problems can shorten downtime from hours to minutes saving production losses.

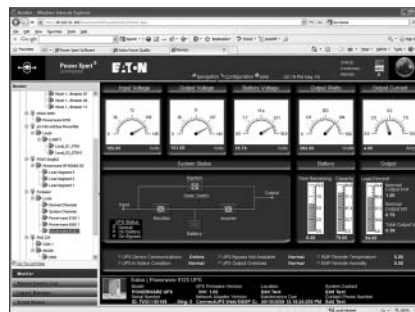
## Increased Productivity

Increased productivity by eliminating the need for time-consuming data collection. Personnel are freed to perform actual maintenance functions that keep facilities operating. Historical archive records and software tools provide simple-to-use tools for collecting energy data for internal and tenant energy billing without manual meter reading or monthly bill calculating.

Load profiles are immediately available for analysis when considering expansion. Spare capacity on existing feeders can be identified through historical load profiling avoiding trips due to seasonal peaks. Correct determination of transformer spare capacity can help avoid unnecessary substation purchases. Double-ended substations designed for redundancy can have their ability to carry loads through a single transformer's outage verified.

## Power Xpert Software Modules

### Power Xpert Software GUI Views/Templates



**Power Xpert Software Graphic View**

The Power Xpert Software Graphic View device template provides a standard layout for displaying Eaton device-specific measurements and data. Graphic templates are built into the software for standard Eaton devices. Viewing the most vital parameters along with self-explaining legends and one-line diagrams is available at a glance. Device-specific information is gathered at the bottom of the screen, including a product picture, location, system contact, maintenance schedule and asset serial number.

Each device category has its own template presenting pertinent information and metrics that are customized for that device type (UPS, PDU, meter, VDF, MCC and the like). You will be able to review a short list of the latest events time-stamped to the millisecond, the picture of the device, and its model information including name, location, contact and serial number. At any point, you can create a custom user view of any device with various gauges, custom icons and imported graphics that change color (green-yellow-red) depending on event status.



**Power Xpert Software List View**

The Power Xpert Software List View device template is provided as a standard layout for all devices, including third-party systems. The List View is available for any device integrated into Power Xpert Software, including third-party products. Typically it arranges product attributes into logical categories and displays them in a spreadsheet format, including continuously updated values and field labels. The List View presents all measurements and data in a spreadsheet format that can be easily viewed and acted upon.



## Power Xpert Software

## Layout Manager

Layout Manager lets you model actual physical representations in a virtual replica of your real-world power system.

- Build complete power system diagrams
- Large library of symbols and icons
- Create building groups that mirror your physical facilities or organization structure
- Create drill-down Web pages and folder structure to display your data the way you want to see it
- Alarm bubble-up ensures alarm events to raise to the top level through the folder structure

## Industry-Specific Templates

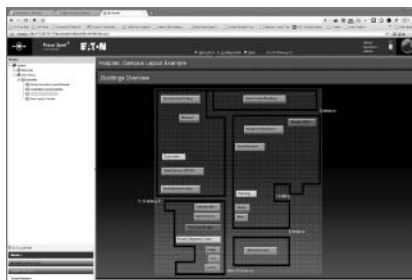
## Power Xpert Software



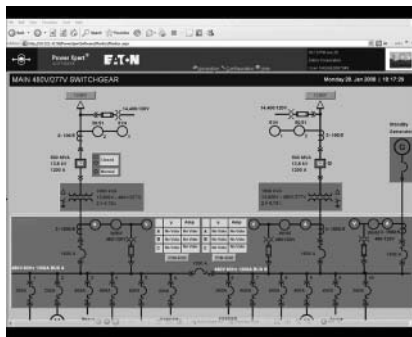
Plant Floor Example User View



Data Center



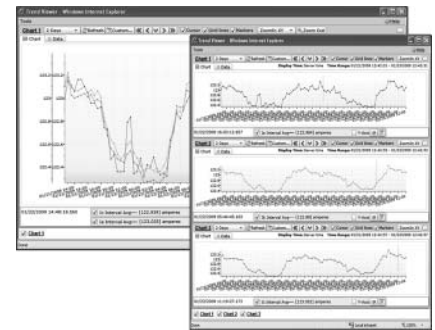
Hospital/Campus User View Examples



Switchgear One-Line Layout Manager

Power Xpert Software has sample graphic layout templates that you can use and modify for various applications and environments. At Eaton, we understand that mimicking the real world is often the best way of keeping your system easy to use and simple to monitor. Included sample templates consist of a typical plant industrial layout, data center, hospital (health care) environment and a generic geographical layout application. All of the templates have typical devices integrated into them and, with the included Layout Manager utility, you can customize them to fit your unique needs.

## Trend Viewer



Trend Viewer

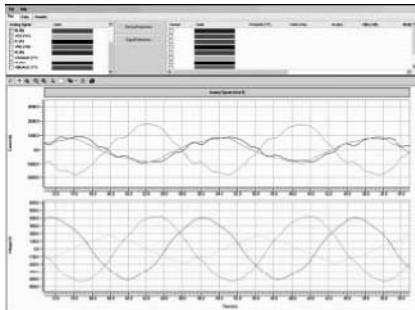
The Trend Viewer gives quick insight into understanding power system device measurement trends. Preventing system overloads, planning future capacity and preventing expensive downtime can be achieved with this tool. The Power Xpert Software Trend Viewer offers a multitude of sophisticated trending capabilities. Viewable charts are quickly plotted with Microsoft's SilverLight™ technology.

Device measurement attributes and other parameters can be easily selected from either the List View or the Custom User View. Trend graphs can be presented in various chart formats one at a time, or you can view multiple charts at the same time. Single and multiple trends can be shown at the same time using fixed or custom time frames. Results can be easily exported to a Microsoft® Excel® spreadsheet.

## Quality Manager

The standard Quality Manager, invoked directly from the event log, provides a tool for detailed waveform analysis. Determining and comparing waveform signatures provides a wealth of information on electrical phenomena, allowing you to take necessary protective action to prevent or protect against further occurrences. Quality Manager allows you to zoom in and out of waveforms, to sample individual parts of a waveform in great detail, and to provide accurate measurement information per points of sampling versus time scale—all the way up to the millisecond time resolution. In addition, this module can open third-party and individual COMTRADE standard files for examination.

- Spot trends faster with easy-to-read graphical displays of real-time information
- Monitor for voltage disturbances, voltage variances, and more
- Analyze complex waveforms
- See trends for historical data



Waveform Analysis Quality Manager

## Installation with Deployment Utility

All key setup requirements are automatically validated. If any of the prerequisites are not met or are incorrectly configured, the deployment utility will alert you to resolve the situation. The best part of using the deployment utility is that it has a button you can click to fix the discovered problem.



Easy Installation with Deployment Utility

## Power Xpert Modbus TCP/IP Connector

- Connects to and retrieves data from devices using Modbus TCP/IP protocol
- Modbus connector provides interfaces to devices from many non-Eaton manufacturers that communicate via industry-standard Modbus TCP/IP
- Requires user configuration and installation of the tool

**Note:** Available with Enterprise edition.

## Power Xpert SNMP Connector

- Connects to and retrieves data from devices using SNMP protocol
- SNMP connector provides interfaces to non-Eaton devices that communicate via SNMP protocol
- Industry-standard SNMP support
- Flexible compiler to process MIB files
- Requires user configuration and installation of the tool

**Note:** Available with Enterprise edition.

## Power Xpert Software

## Integrated PowerNet Support

**PowerNet (available on the Power Xpert Software DVD)**

## General Description

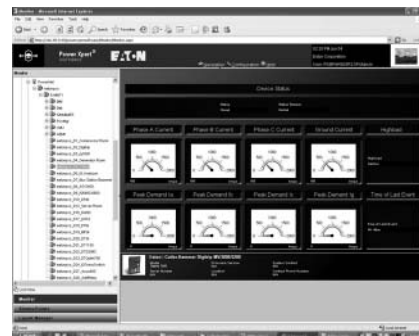
The features of Eaton's PowerNet software suite is available as a standard part of Power Xpert Software. PowerNet is a family of software applications, client/ server configuration, that help provide a window into an electrical distribution system. Existing PowerNet systems can be easily integrated with Power Xpert Software.

## PowerNet Features

- Connectivity bundle
  - Communication to 1000 INCOM devices
  - Auto learn of all INCOM connected devices for maximum usability
  - Security configuration
  - Trending/logging configurations
  - Device set point editing/printing/viewing
  - MSDE/SQL data storage
  - Dynamic Data Exchange (DDE) server
  - OLE for Process Control (OPC) server
  - Modbus RTU Gateway to data from Eaton INCOM communicating devices

- Power quality bundle
  - Viewing of captured waveforms
  - Up to eight cycles of actual waveform
  - Zoomed-in view of high-speed waveform samples
  - Spectrum chart showing frequency content and magnitude (Fourier analysis)
  - CBEMA/ITIC representation of events
  - Top down access to specific Waveform events from event lists and CBEMA/ITIC curves
  - Trip curve display for coordination and selectivity needs
  - Log-log coordination curve plotted on-screen for trip units and motor protective relays with the click of a button
  - Online modification of trip curve pickups and time delays; instant verification of coordination with an updated trip curve

- Automatic scale adjustment based on device pickup level
- Addition or removal of trip curves directly from the display screen
- Color-coded curves tied to the device description for added clarity
- Overlay multiple curves
- View motor start profiles next to motor protection relay trip curve



**PowerNet Digitrip Screen Viewed in Power Xpert Software**

**Table 2.4-3. PowerNet Waveform—Captured Waveforms**

Captured Waveform	Eaton Device				
	IQ Analyzer	Digitrip			MPCV Relay
		910	1150	OPTIM 1050	
<b>Currents</b>					
Phase A	■	■	■	■	■
Phase B	■	■	■	■	■
Phase C	■	■	■	■	■
Neutral Ground	■		■	■	
<b>Voltages</b>					
Line-Line	■				
Line-Neutral	■				■
Ground-Neutral Transformer	■				■

## Power Xpert Reporting Software

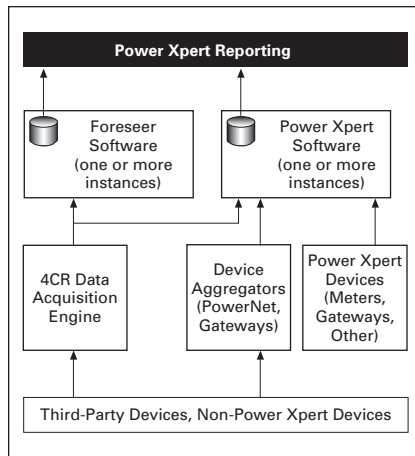
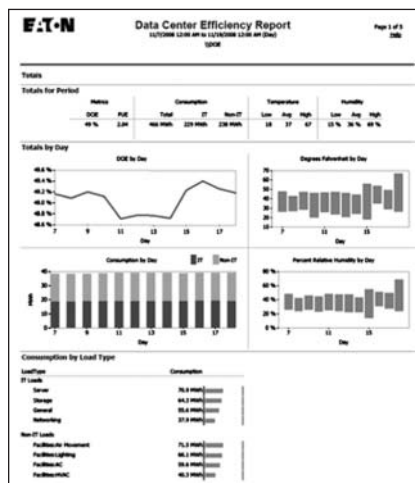


Figure 2.4-2. Power Xpert Reporting Architectural Overview

Power Xpert Reporting brings the power system information together to compare and contrast. Power Xpert Reporting provides a standard set of reports, including:

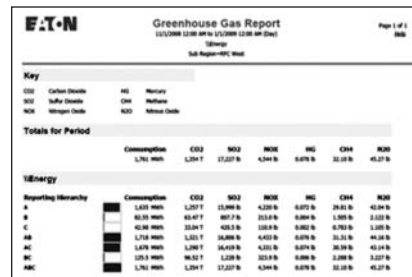
### ■ Data Center Efficiency Report:

A summary of data center infrastructure efficiency and power usage effectiveness, including such information as temperature and humidity, and energy consumption



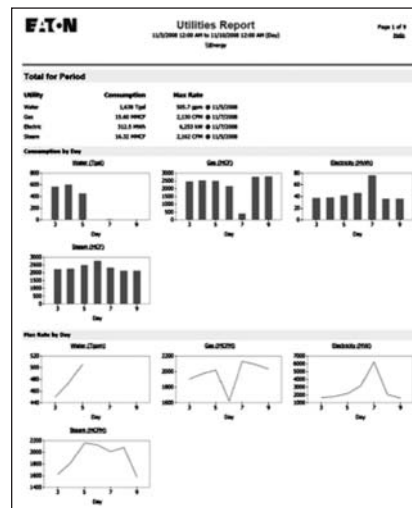
Data Center Efficiency Report

■ **Greenhouse Gas Report:** Captures the six offensive greenhouse gasses: carbon dioxide, sulfur dioxide, nitrogen oxide, mercury, methane and nitrous oxide broken down by selected locations within a facility



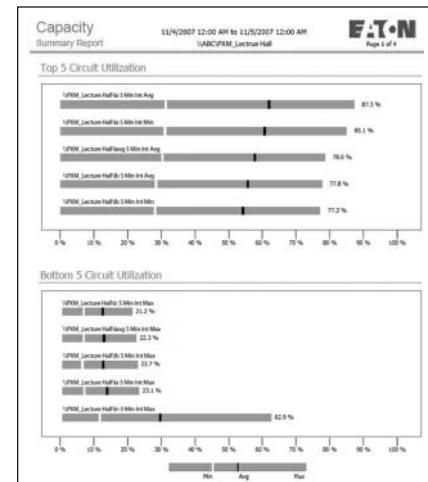
Greenhouse Gas Report

■ **Utilities Report:** Captures consumption of water, air, gas, electricity and steam (WAGES)



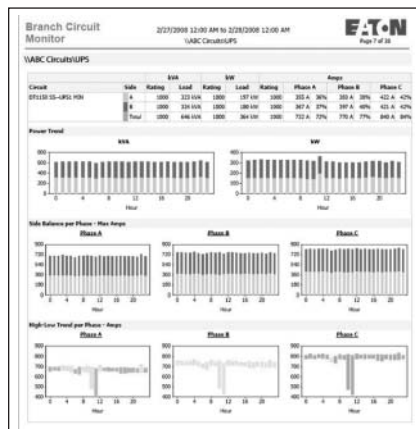
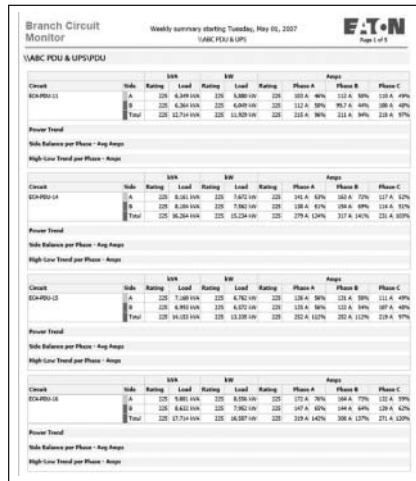
Utilities Report

■ **Capacity Summary Report:** The summary of top- and bottom-loaded circuits, as well as loading details for each circuit according to user-defined date/time range and facility hierarchy location



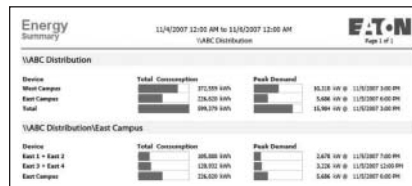
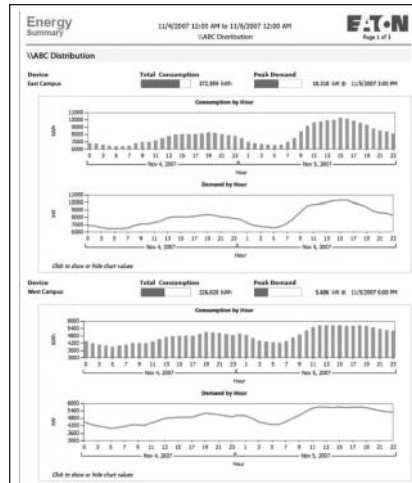
Capacity Summary Report

- **Branch Circuit Monitoring Report:** Determine branch circuit loading levels at a glance with color-coded graphics indicating loading status against capacity. Redundant sources can be reviewed, as well as single source loads



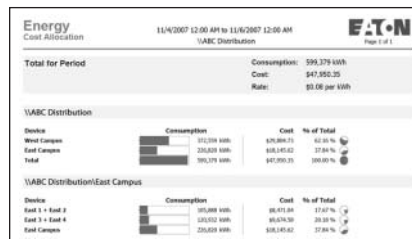
Branch Circuit Monitoring Report

- **Energy Summary Report:** The summary of consumption (kWh) and demand (kW) for a user-defined date/time range and facility hierarchy location



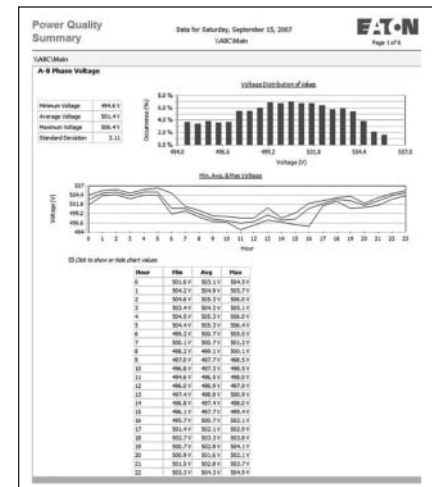
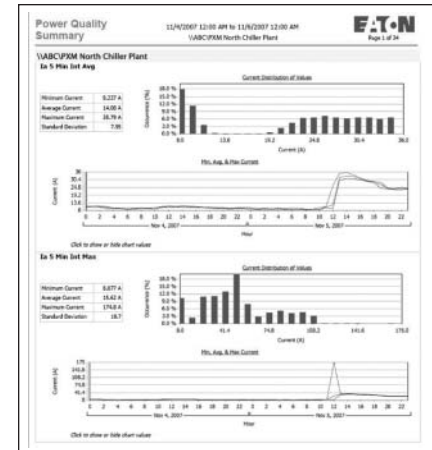
Energy Summary Report

- **Energy Cost Allocation Report:** The total energy bill dollar value or a cost per kWh across a facility hierarchy for a user-defined date/time range



Energy Cost Allocation Report

- **Power Quality Report:** The distribution and trend for amps, volts and THD according to user-defined date/time ranges and facility hierarchy location

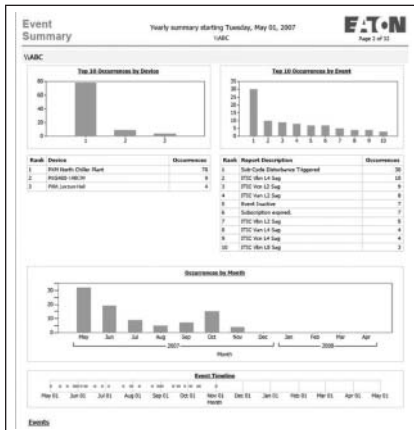


Power Quality Report



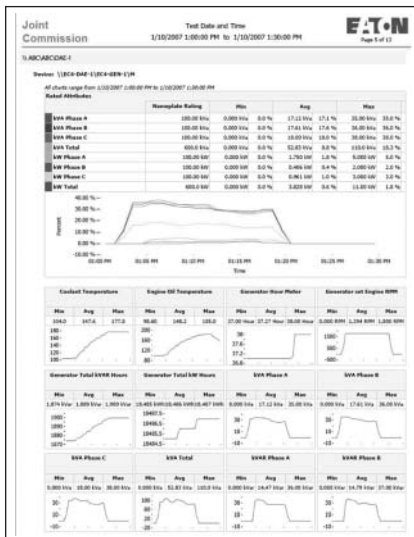
## Power Xpert Software

- **Event Summary Report:** Provides a Pareto chart of events according to user-defined date/time ranges and facility hierarchy location



Event Summary Report

- **Joint Commission Report:** Standard Joint Commission Compliant Report supports hospital power test requirements. It checks events, key metrics of generators and automatic transfer switches (ATS) during generator testing at user-defined date/time ranges and facility hierarchy location



Joint Commission Report

## Service Offerings

**Available Power Xpert Startup Service Packs**

At Eaton, we want to make it as easy and non-disruptive as possible to implement our Power Xpert products. Eaton offers several startup service packs from partial help to full turnkey solution implementation.

All services are performed by authorized Eaton Electrical Services & Systems group personnel.

**Startup Service Packs Include the Following Services**

- **Startup scope determination**  
Eaton services will help you evaluate your service needs and check that the service pack you have selected has appropriate coverage for your circumstances
- **Pre-installation checkup**  
Eaton services will contact you to go through the pre-installation checklist, which ensures efficient, prime quality installation and configuration services

■ **Installation and configuration**

Eaton services will install Power Xpert Software and configure it for operation with your equipment according to startup scope determination. Configuration may also include creating custom graphic layouts if necessary and required

■ **System test**

Eaton services will test the Power Xpert Software for operability and will validate communications with key components

■ **Optional hands-on training**

If required, Eaton services can provide hands-on training for Power Xpert Software, using the software on-site or using simulated demo systems

Table 2.4-4. Selecting the Appropriate Service Pack ①

Startup Service Product	Number of Eaton Devices to be Integrated				
	<15 ②	15-30 ②	31-75 ②	>75 ②	Non-Eaton Devices ③
Power Xpert 1 Day	■				
Power Xpert 2 Day		■			
Power Xpert 5 Day			■		
Customer Fixed Price Quote ④				■	■

① Available and valid in continental United States only.

② Typical number of Eaton devices that can be configured in the Power Xpert Software during the course of the selected Startup Service Pack.

③ We strongly recommend a review of the latest Hardware Capability List at [www.eaton.com/pxs](http://www.eaton.com/pxs).

④ Please call the Technical Resource Center for custom Startup Service at 800-809-2772, option 4, 1 for a price quote.

**Note:** The number of devices that can be configured during the course of a selected Start Pack can vary depending on the devices' installation readiness levels. Maximum numbers indicated require full configuration readiness levels defined in the Power Xpert Startup Services Checklist document in the service's brochure at [www.eaton.com/pxs](http://www.eaton.com/pxs).



## Power Xpert Software

Table 2.4-5. Technical Specifications

Power Xpert Startup Service Pack Guidelines	Description
1 day	8 hrs, on-site, M–F 8:00 a.m. – 5:00 p.m.
2 day	16 hrs, on-site, two consecutive days, M–F 8:00 a.m. – 5:00 p.m.
5 day	5-day 40 hrs, on-site, five consecutive days, M–F 8:00 a.m. – 5:00 p.m.
Additional services	Can be purchased at Eaton prevailing time and service time material rates or fixed price quote can be provided. Call 1-800-809-2772 option 4, 1.
After hours service	If required during night shift or weekend, additional service costs will apply and a purchase order must be received for the premium time prior to scheduling the service.
Customer required training	Any required safety training will be charged at the required training service hours purchased. Any expenses required or safety training (i.e., drug testing payments) will be an extra charge.
<b>Customer Requirements</b>	
IP addresses	IP addresses are required for the serving computer, certain communicating devices and certain device interfaces. Static IP addresses including subnet mask and default gateway must be provided prior to scheduling service.
Connections	The system must be fully wired and connected prior to commencing service. This includes any network drops for any TCP/IP devices and actual device wiring (i.e., INCOM or Modbus networks).
Device compatibility	We strongly recommend that you review Eaton's full Hardware Compatibility List available at <a href="http://www.eaton.com/pxs">www.eaton.com/pxs</a> .
<b>Travel</b>	
Travel costs	The pricing includes both travel and lodging in the continental United States.
<b>Selling policy</b>	
Eaton selling policy	Eaton Selling Policy 5-000 applies to all Power Xpert Policy Startup Service Pack sales.
<b>Validity and restrictions</b>	
Availability	Eaton Power Xpert Startup Service Packs are available and valid in the continental United States only.
Validity	Valid for 12 months after date of purchase.
Scheduling	Recommended to schedule a service appointment within the first three months of purchase.
Advance notice	A minimum of three weeks advance notice is required prior to requested service date.

Table 2.4-6. Power Xpert Software

Description	Catalog Number
<b>Power Xpert Software Professional Edition</b>	
Power Xpert Software Professional Edition Power Xpert Software Professional Edition w/ 1-day startup Power Xpert Software Professional Edition w/ 2-day startup	PXS-PRO PXS-PRON1S PXS-PRON2S
Power Xpert Software Professional Edition w/ 5-day startup Power Xpert Software Professional Edition and Power Xpert Reporting	PXS-PRON5S PXS-PRONPXR
<b>Power Xpert Software Enterprise Edition</b>	
Power Xpert Software Enterprise Edition Power Xpert Software Enterprise Edition w/ 1-day startup	PXS-ENT PXS-ENTN1S
Power Xpert Software Enterprise Edition w/ 2-day startup Power Xpert Software Enterprise Edition w/ 5-day startup	PXS-ENTN2S PXS-ENTN5S
<b>Power Xpert Reporting</b>	
Power Xpert Reporting—single source DB connection Power Xpert Reporting—up to 2 source DB connections Power Xpert Reporting—up to 5 source DB connections	PXR PXR-2DB PXR-5DB
Power Xpert Reporting—up to 10 source DB connections Power Xpert Reporting—up to 25 source DB connections Power Xpert Reporting—up to 50 source DB connections	PXR-10DB PXR-25DB PXR-50DB
<b>Service Packs</b>	
Power Xpert 1-day startup Service Pack Power Xpert 2-day startup Service Pack Power Xpert 5-day startup Service Pack	PX-1S PX-2S PX-5S

## Power Xpert Software

## Technical Data and Specifications

## Hardware Requirements

Power Xpert Software (PXS) requires a server-class machine with the following minimum hardware specifications:

Table 2.4-7. Hardware Specifications

Hardware	Specification
Processor	2.8 GHz, dual-core processor
Memory	2 GB allocated for PXS (allocate 3 GB of memory to a virtual machine session running PXS)
Disk space required for application	The PXS application itself requires 190 MB of disk storage
Disk space required for database	A typical database will grow to 2 GB within a year. If you have a large number of devices, reserve additional storage space
Video resolution	1280 by 1024 pixels or higher
Removable media	DVD RO drive

You may wish to add the following hardware as well:

- Local printer
- Sound card (if sounds are assigned to specific alarm conditions)
- Modem (for remote alarm notification to machines not available via your network)

## Software Requirements

## Supported operating systems

- Microsoft Windows Server 2003 R2 (Standard or Enterprise) 32-bit edition
- Microsoft Windows XP Professional (32-bit) with Service Pack 3, 32-bit
- Windows Server 2008 (Standard or Enterprise), 32-bit or 64-bit
- Windows Server 2008 R2 (Server or Enterprise), 32-bit or 64-bit
- Windows 7 Professional, Ultimate or Enterprise editions, either 32-bit or 64-bit

## Software components

- IIS 5.0 or higher (must be installed prior to installing PXS; for Windows 7 and Windows Server 2008, this is installed automatically)
- Microsoft Internet Explorer® 7.0 or 8.0

## Third-Party Software Installed

The following Microsoft software is also installed during the PXS installation.

- .NET Framework 3.5 SP1
- Windows Installer 4.5
- C++ Runtime Library 2008
- Microsoft Data Access 2.8
- SQL Server 2008 Express SP2
- SQL Server 2005 Express Management Studio SP2

## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) ①

Device	Communication Protocol	Supported Directly in Power Xpert Software	Supported via PowerNet Server (Built into PXS)	Supported via Foreseer Server (Built into PXS)	Supported via Power Xpert Gateway 200E	Supported via Power Xpert 400E/600E/800E Gateway	Supported via Power Xpert Gateway PDP/1000 Card	Supported via Power Xpert Gateway UPS/2000 Card	Supported via ConnectUPS SNMP/Web Card
<b>Eaton UPSs</b>									
5115 UPS	SNMP			■				■	■
5125 UPS	SNMP			■				■	■
5130 UPS	SNMP			■				■	
9120 UPS	SNMP			■					■
9120 UPS	XCP/BCM			■					■
9125 UPS	SNMP			■				■	■
9125 UPS	XCP/BCM			■				■	■
9130 UPS	SNMP			■					■
9135 UPS	SNMP			■				■	
9140 UPS	SNMP			■				■	
9150 HV single-phase UPS	XCP/BCM			■					■
9150 HV three-phase UPS	XCP/BCM			■					■
9150 LV UPS	XCP/BCM			■					■
9155 two-phase UPS	BACnetWS+	■						■	
9155 three-phase UPS	BACnetWS+	■						■	
9155 three-phase UPS	SNMP			■				■	■
9155 UPS	BACnetWS+	■						■	
9155 UPS	SNMP			■				■	■
9170 Plus two-phase UPS	XCP/BCM			■					■
9170 Plus single-phase UPS	XCP/BCM			■					■
9305 UPS	XCP/BCM			■					■
9305 UPS	UCII			■					■
9305 UPS	SNMP			■					■
9305 UPS	XCP/BCM/UCII			■					■
9315 50–500 UPS	XCP/BCM			■				■	■
9315 50–500 UPS	SNMP			■				■	■
9315 750 UPS	XCP/BCM			■				■	■
9315 750 UPS	SNMP			■				■	■
9315 SBM	SNMP			■				■	■
9315 SBM with MBP	BACnetWS+	■						■	
9315 SBM without MBP	BACnetWS+	■						■	
9315 UPM with Bypass	BACnetWS+	■						■	
9315 UPM without bypass	BACnetWS+	■						■	
9320 UPS	XCP/BCM			■					
9330 UPS	SNMP			■					■
9330 UPS	XCP/BCM			■					
9335 UPS	SNMP			■					
9335 UPS	XCP/BCM			■					
9340 UPS	XCP/BCM			■					

① These specifications are subject to change without notice and represent typical configurations that may require additional connectivity products in conjunction with Power Xpert Software. Features and functionality may vary depending on selected options and product model, and depending on the communication methods being used and firmware versions, some device-specific parameters may not get always passed through to the software. Please refer to the Technical Data Sheets and User Manuals for detailed specifications and parameter availability. Please refer to the Hardware Compatibility List posted at [www.eaton.com/pxs](http://www.eaton.com/pxs) for latest version and details.

**Note:** For updated list, see [www.eaton.com/pxs](http://www.eaton.com/pxs).

## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) (Continued) ①

Device	Communication Protocol	Supported Directly in Power Xpert Software	Supported via PowerNet Server (Built into PXS)	Supported via Foreseer Server (Built into PXS)	Supported via Power Xpert Gateway 200E	Supported via Power Xpert 400E/600E/800E Gateway	Supported via Power Xpert Gateway PDP/1000 Card	Supported via Power Xpert Gateway UPS/2000 Card	Supported via ConnectUPS SNMP/Web Card
<b>Eaton UPSs (Continued)</b>									
9355 UPS	BACnetWS+	■						■	
9390 2-module	SNMP			■				■	■
9390 3-module	SNMP			■				■	■
9390 4-module	SNMP			■				■	■
9390 UPS	SNMP			■				■	■
9390 UPS	BACnetWS+	■						■	■
9395 2-module	SNMP			■				■	■
9395 3-module	SNMP			■				■	■
9395 4-module	SNMP			■				■	■
9395 5-module	SNMP			■				■	■
9395 6-module	SNMP			■				■	■
9395 7-Module	SNMP			■				■	■
9395 8-Module	SNMP			■				■	■
9395 distributed parallel with SBM	BACnetWS+	■						■	
9395 distributed parallel without SBM	BACnetWS+	■						■	
9395 UPS	BACnetWS+	■						■	
9395 UPS	SNMP			■					■
BladeUPS	SNMP			■				■	■
BladeUPS 2-module	SNMP			■				■	■
BladeUPS 3-module	SNMP			■				■	■
BladeUPS 4-module	SNMP			■				■	■
BladeUPS 5-module	SNMP			■				■	■
BladeUPS 6-module	SNMP			■				■	■
BladeUPS module	SNMP			■				■	■
Ferrups	SNMP			■					■
IPM BP III UPS, BCM	XCP/BCM			■					
IPM BP IV BCM	XCP/BCM			■					
IPM BP Plus UPS	XCP/BCM			■					
IPM BP II UPS, P-Record single-phase	XCP/BCM			■					
IPM BP II UPS, P-Record three-phase	XCP/BCM			■					
Plus 18–36 UPS	XCP/BCM			■					
Prestige UPS	SNMP			■					■
Prestige UPS	XCP/BCM			■					

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## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) (Continued) ①

Device	Communication Protocol	Supported Directly in Power Xpert Software	Supported via PowerNet Server (Built into PXS)	Supported via Foreseer Server (Built into PXS)	Supported via Power Xpert Gateway 200E	Supported via Power Xpert 400E/600E/800E Gateway	Supported via Power Xpert Gateway PDP/1000 Card	Supported via Power Xpert Gateway UPS/2000 Card	Supported via ConnectUPS SNMP/Web Card
<b>Eaton Power Distribution Equipment</b>									
EMS-PDR	BACnetWS+	■					■		
EMS-PDU	BACnetWS+	■					■		
EMS-RPM	BACnetWS+	■					■		
EMS-RPP	BACnetWS+	■					■		
ePDU MI red display 208V 30A (6-30, L6-30)	SNMP	■		■					
ePDU MI red display 208V 60A (IEC 309-60 1P)	SNMP	■		■					
ePDU MI red display all 120V (5-xx, L5-xx), ePDU MI red display 208V 20A (6-20, L6-20)	SNMP	■		■					
ePDU MI red display split-phase 20A (L14-20), ePDU MI red display split-phase 30A (L14-30)	SNMP	■		■					
Monitored ePDU blue display	SNMP	■		■					
Monitored ePDU red display three-phase	SNMP	■		■					
PDU panel, PDU subfeed, EMS panel, EMS subfeed	BACnetWS+	■					■		
Switched ePDU 16 outlets single-phase	SNMP	■		■					
Switched ePDU 24 outlets single-phase	SNMP	■		■					
Switched ePDU 24 outlets three-phase	SNMP	■		■					
Switched ePDU 8 outlets single-phase	SNMP	■		■					

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## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) (Continued) ①

Device	Communication Protocol	Supported Directly in Power Xpert Software	Supported via PowerNet Server (Built into PXS)	Supported via Foreseer Server (Built into PXS)	Supported via Power Xpert Gateway 200E	Supported via Power Xpert 400E/600E/800E Gateway	Supported via Power Xpert Gateway PDP/1000 Card	Supported via Power Xpert Gateway UPS/2000 Card	Supported via ConnectUPS SNMP/Web Card
<b>Eaton Meters</b>									
IQ Analyzer 6000/6200	INCOM		■			■			
IQ Analyzer 6400/6600	INCOM		■			■			
IQ Data, IQ Generator	INCOM		■			■			
IQ DataPlus, IQ DataPlus II, IQ DataPlus II Goldstar, IQ DataPlus II HV	INCOM		■			■			
IQ DP-4000	INCOM		■			■			
IQ Multipoint ES	INCOM		■		■				
IQ Multipoint ESII	INCOM		■		■	■			
IQ Power Sentinel	INCOM		■			■			
IQ Sentinel, univ. w/external CTs, univ. multiple well-head, univ. single well-head	INCOM		■		■				
IQ 130	Modbus RTU				■	■			
IQ 140	Modbus RTU				■	■			
IQ 150	Modbus RTU				■	■			
IQ 200/IQ 300, IQ 220/320, IQ 230/IQ 330	INCOM		■		IQ 220/230	■			
IQ 230M/IQ 330M (three-wire)	Modbus RTU		■		■	■			
IQ 230M/IQ 330M (four-wire)	Modbus RTU		■		■				
IQ 250	Modbus RTU				■	■			
IQ 260	Modbus RTU				■	■			
IQ 7000	INCOM		■						
Meter point	INCOM		■		■				
Power Manager, Power Manager, w/inp. trans.	INCOM		■						
Power Xpert Meter 2250	BACnetWS+	■							
Power Xpert Meter 2260	BACnetWS+	■							
Power Xpert Meter 2270	BACnetWS+	■							
Power Xpert Meter 4000	BACnetWS+	■							
Power Xpert Meter 6000	BACnetWS+	■							
Power Xpert Meter 8000	BACnetWS+	■							

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## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) (Continued) ①

Device	Communication Protocol	Supported Directly in Power Xpert Software	Supported via PowerNet Server (Built into PXS)	Supported via Foreseer Server (Built into PXS)	Supported via Power Xpert Gateway 200E	Supported via Power Xpert 400E/600E/800E Gateway	Supported via Power Xpert Gateway PDP/1000 Card	Supported via Power Xpert Gateway UPS/2000 Card	Supported via ConnectUPS SNMP/Web Card
<b>Eaton Circuit Protection Products</b>									
ARMS IDM	INCOM/Modbus		■			■			
C441 overload relay	INCOM/Modbus		■			■			
Digitrip 520MC	INCOM/Modbus		■			■			
Digitrip 700/800	INCOM/Modbus		■			■			
Digitrip 810	INCOM/Modbus		■			■			
Digitrip 910	INCOM/Modbus		■			■			
Digitrip MV, Digitrip 3000, Digitrip 3200	INCOM/Modbus		■			■			
Digitrip OPTIM 1050	INCOM/Modbus		■			■			
Digitrip OPTIM 550, Digitrip OPTIM 750	INCOM/Modbus		■			■			
DT1150/DT1150V/ Navy	INCOM/Modbus		■			■			
EDR-3000	INCOM/Modbus		■			■			
EDR-4000	INCOM/Modbus		■			■			
ETR-4000	INCOM/Modbus		■			■			
FP-4000/FP-5000	INCOM/Modbus		■			■			
FP-6000	INCOM/Modbus		■			■			
IQ 500 overload relay	INCOM/Modbus		■			■			
MMCO relay	INCOM/Modbus		■			■			
MP-3000, MP-4000	INCOM/Modbus		■			■			
MPCV relay	INCOM/Modbus		■			■			
Series NRX 1150	INCOM/Modbus		■			■			
Series NRX 519	INCOM/Modbus		■			■			
Series NRX 520M	INCOM/Modbus		■			■			
<b>Eaton DC Systems</b>									
SC200 system controller	SNMP								
<b>Eaton Sub-Network Master</b>									
AEM, AEMII	INCOM/Modbus		■			■			
AIM	INCOM/Modbus		■						
BIM/BIMII	INCOM/Modbus		■			■			
CMU	INCOM/Modbus		■			■			
IQ 1000	INCOM/Modbus		■						
IQ 1000II, IQ 1000II Goldstar	INCOM/Modbus		■						
IQ CED, IQ CED II	INCOM/Modbus		■			■			
WCMU	INCOM/Modbus		■						
<b>Eaton Transfer Switch</b>									
ATC-400	INCOM/Modbus		■			■			
ATC-600	INCOM/Modbus		■			■			
ATC-800	INCOM/Modbus		■			■			

- ① These specifications are subject to change without notice and represent typical configurations that may require additional connectivity products in conjunction with Power Xpert Software. Features and functionality may vary depending on selected options and product model, and depending on the communication methods being used and firmware versions, some device-specific parameters may not get always passed through to the software. Please refer to the Technical Data Sheets and User Manuals for detailed specifications and parameter availability. Please refer to the Hardware Compatibility List posted at [www.eaton.com/pxs](http://www.eaton.com/pxs) for latest version and details.
- ② Supported by Power Xpert Enterprise Edition.

**Note:** For updated list, see [www.eaton.com/pxs](http://www.eaton.com/pxs).

## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) (Continued) ①

Device	Communication Protocol	Supported Directly in Power Xpert Software	Supported via PowerNet Server (Built into PXS)	Supported via Foreseer Server (Built into PXS)	Supported via Power Xpert Gateway 200E	Supported via Power Xpert 400E/600E/800E Gateway	Supported via Power Xpert Gateway PDP/1000 Card	Supported via Power Xpert Gateway UPS/2000 Card	Supported via ConnectUPS SNMP/Web Card
<b>Eaton Starters</b>									
ACM/Advantage	INCOM		■			■			
Advantage	INCOM		■			■			
IQ 500 overload relay	INCOM		■						
IT: Starter S811 (MV811)	QCport					■			
IT: Starter QSnap	QCport					■			
IT: Starter with cover controls	QCport					■			
D77A-AI16	QCport					■			
D77A-DI16	QCport					■			
D77A-DI8	QCport					■			
<b>Eaton Drives</b>									
Accutrol 400	INCOM/Modbus		■			■			
AF97	INCOM/Modbus		■			■			
MOVX9000	Modbus RTU					■			
SVX9000	Modbus RTU					■			
<b>Eaton I/O</b>									
DIM	INCOM/Modbus		■			■			
D77A-AI16	QCport					■			
D77A-AI8	QCport					■			
D77A-DI16	QCport					■			
D77A-DI18	QCport					■			
Foreseer DAT	SNMP								■
Universal RTD	INCOM/Modbus		■			■			
<b>Environmental Monitoring</b>									
EMP	Communications Card						■	■	■
Qualitrol 118	INCOM/Modbus					■			
Wireless temperature sensor	802.11g	■							
<b>Integration Tools</b>									
LanSafe SNMP agent	SNMP					■			
Third-party custom device driver support ②	Various	■							
Third-party Modbus TCP compatible devices ②	Modbus TCP	■							
Third-party SNMP compatible devices ②	SNMP	■							

① These specifications are subject to change without notice and represent typical configurations that may require additional connectivity products in conjunction with Power Xpert Software. Features and functionality may vary depending on selected options and product model, and depending on the communication methods being used and firmware versions, some device-specific parameters may not get always passed through to the software. Please refer to the Technical Data Sheets and User Manuals for detailed specifications and parameter availability. Please refer to the Hardware Compatibility List posted at [www.eaton.com/pxs](http://www.eaton.com/pxs) for latest version and details.

② Supported by Power Xpert Enterprise Edition.

**Note:** For updated list, see [www.eaton.com/pxs](http://www.eaton.com/pxs).

## Power Xpert Software

Table 2.4-8. Power Xpert Software (PXS) Hardware Compatibility List (HWCL) (Continued) ①

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--------	------------------------	--------------------------------------------	------------------------------------------------	------------------------------------------------	----------------------------------------	--------------------------------------------------	-------------------------------------------------	-------------------------------------------------	----------------------------------------

**Miscellaneous**

Addressable relay, addressable relay inv.	INCOM/Modbus		■			■			
Alarm relay	INCOM/Modbus		■			■			
Breaker controller	INCOM/Modbus		■			■			
InsulGard insulation monitor	Modbus					■			
IQ Transfer Switch II	INCOM/Modbus		■			■			
Pow-R-Command	INCOM/Modbus		■			■			
Wireless current sensor	INCOM/Modbus		■			■			

**Third-Party Device Support**

ABB TPU 2000	Modbus					■			
GE 369 motor relay	Modbus					■			
GE 469 motor relay	Modbus					■			
EI Nexus 1262/1272	Modbus				■	■			
PML 7350 meter series	Modbus					■			
PML 7550 meter series	Modbus					■			
PML 7650 meter series	Modbus					■			
Power Xpert Gateway third-party device support	Modbus					■			
Square D CM3000 meter series	Modbus					■			
Square D CM4000/4250 meter series	Modbus					■			
Square D PM710 meter series	Modbus				■	■			
Square D PM810/820/850/870 meter series	Modbus					■			

① These specifications are subject to change without notice and represent typical configurations that may require additional connectivity products in conjunction with Power Xpert Software. Features and functionality may vary depending on selected options and product model, and depending on the communication methods being used and firmware versions, some device-specific parameters may not get always passed through to the software. Please refer to the Technical Data Sheets and User Manuals for detailed specifications and parameter availability. Please refer to the Hardware Compatibility List posted at [www.eaton.com/pxs](http://www.eaton.com/pxs) for latest version and details.

**Note:** For updated list, see [www.eaton.com/pxs](http://www.eaton.com/pxs).

## Foreseer Services

2

**Foreseer® Services**

Foreseer Software and Engineering Services (Foreseer Services) provide vendor independent, power and energy infrastructure integration solutions that help companies reduce energy consumption and unplanned downtime due to the failure of critical power, environmental, safety or security systems.

Turnkey software and connectivity solutions are coupled with state-of-the-art project management, systems design, third-party device integration, testing and custom application development to develop a comprehensive monitoring solution to meet your custom needs.

Foreseer Services is delivered in four categories, each offering a multitude of unique value-add services that you can discuss with your Eaton sales professional.

- Design services
- Installation services
- Commissioning services
- Follow-up services
- Hardware services
- Software services

Foreseer services is fully distributable to allow different monitoring capabilities to be deployed at different sites allowing you to purchase only what is needed. Many competitive systems offer a one-size-fits all type approach where you end up paying for more capacity than is needed. With Foreseer Services, you pay only for what you need, when you need it.

**Four Scalable Solutions**

Foreseer Software Services is available in four classes, capable of handling 15,000 to 256,000 data streams (channels), so you can be assured

of the best fit for various integration environments, and the right solution at the right price.

**Foreseer Services Categories**

Foreseer Services has three general categories:

- Foreseer Software Services
- Foreseer Project Management Services
- Foreseer Engineering Services

**Foreseer Software Services—Unique Features****Four scalable solutions**

Four classes, capable of handling 15,000 to 256,000 data streams (channels).

- Software (up to 15,000 channels)
- Foreseer M-Class server software (up to 25,000 channels)
- Foreseer R-Class server software (up to 100,000 channels)
- Foreseer S-Class server software (up to 256,000 channels)

**Redundant, Worldwide Coverage**

The inclusion of one or more extra Foreseer servers provides the highest possible levels of system reliability. In the unlikely event that one Foreseer server fails then the remaining servers can carry the load of the power monitoring system.

With the Manager of Managers (MOM) software option, data from one server can be monitored alongside data from other servers, enabling you to aggregate multiple Foreseer sites into a single system.

**Data Gathering, 24/7**

A proactive algorithm gathers data 24/7, enabling you to sample data points from thousands of devices, every second.

**User-Defined Formulas**

Information from multiple sources and systems can be inserted into user defined formulas, providing knowledge for informed decision making.

**Extensive Device Driver Library**

Foreseer Software Services enables the full-scale integration of third-party products. A device library of over 600 drivers has been developed. For a full list of compatible devices, see the Foreseer services/hardware compatibility list at [www.eaton.com/foreseer](http://www.eaton.com/foreseer).

**Trend Analysis**

High performance analysis and forecasting tools assess equipment performance specifications including cause analysis, impact analysis, capacity planning, preventive maintenance assessments and trending.

**Custom User Interfaces**

Custom, mimic graphics, dashboards, and 3D renderings.

**Web Browser Access—Unlimited Seats**

Web browser access enables easy system access. Multiple users can access Foreseer software without the need for additional client seat licenses.

**Alarm Notifications**

For each channel being monitored, you can assign up to four alarm thresholds—from routine maintenance alerts to system failure—plus handling instructions and escalation procedures for each.

**Foreseer Project Management Services**

Each Foreseer integration project can be customized. See **Figure 2.4-3** for an overview of project flow.

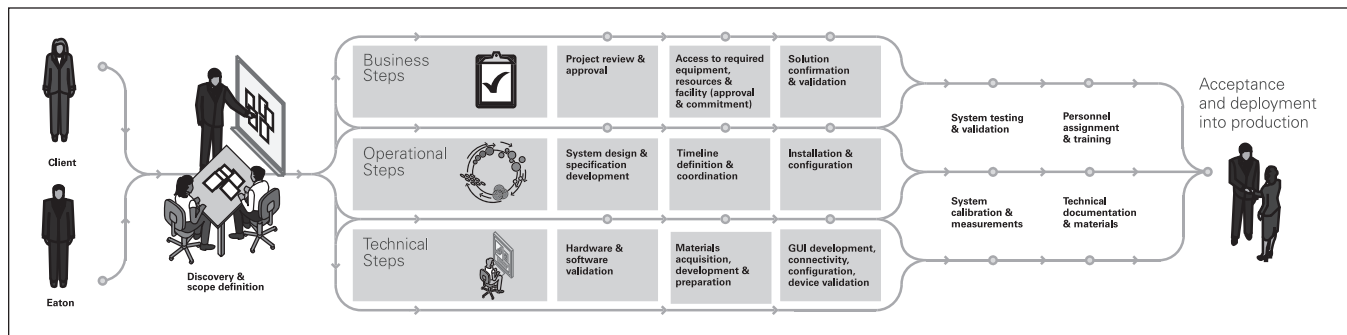


Figure 2.4-3. Foreseer Project Management Services

**Foreseer Engineering Services****Design Services**

After extensive assessment of your requirements and the existing device and facility infrastructure, the Foreseer design services team configures your system, complete with a bill of materials and recommendations unique to your needs. Specification development, drawings and detailed documentation for your project is part of this step. Third-party device support and communication interface planning is critical, including driver development and enhancement, if necessary. User interfaces are designed with default views to meet your specifications.

**Installation Services**

Installation services team members are with you from project initiation to handing over the Foreseer system when work is complete. Tasks include:

- Startup needs, testing and customization
- Drawings and custom graphic layout development
- Customized device gauge graphics and status indicators
- Third-party software integration
- Custom software and application development
- Setup and configuration of reporting packages and basic Foreseer training

**Commissioning Services**

Commissioning services consist of overall and tiered systems testing and full point-to-point system commissioning options.

**Follow-up Services**

Our follow-up services team handles all issues related to connectivity, device installation, configuration and customization, hardware integration, third-party system setup, configuration and testing. Technical support and customized service contracts with scheduled site visits are also available with advanced Foreseer system training.

**Custom Foreseer Services Applications****Data Center Efficiency****Eaton Powerware UPS-Primary View****Calculates DCiE and PUE**

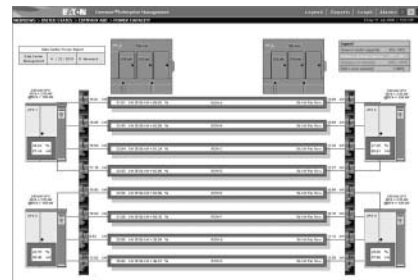
Use Foreseer Software Services Power Xpert Reporting option to automatically calculate Data Center Infrastructure Efficiency (DCiE) and Power Usage Effectiveness (PUE). These industry-standard efficiency metrics help IT managers to understand and to track how efficiently their data center is running and how effective improvement efforts have been.

**Energy Cost Allocation****Fair Share Utility Cost Distribution**

Foreseer Software provides energy usage by individual circuit so each device can be a part of the energy management strategy. It even allocates electrical cost to individual and branch circuits, which can then be assigned to individual users of a department or device.

**Power Density****Pinpoint Hot Spots in Your Data Center**

Power density is a critical measurement as racks proliferate and expand from TCP/IP networks and servers and other elements of the infrastructure are placed into smaller areas. Foreseer Software manages power density by device, for a single rack, floor or an entire building, allowing identification of overloaded racks and incorrect power drains due to device failure.

**Growth Planning****Power Capacity View**

The Power Capacity View provides an at-a-glance simple analysis of the data center's electrical capacity. Normal, cautionary and alarm events are triggered automatically, both online and remotely once a threshold has been reached. Mapping the data center's capacity is critical for power, cooling and redundancy planning. With Foreseer Software projection graphing capability, data center managers can easily predict when they are going to hit a capacity threshold going into the future and can prepare accordingly.

**Plan with the Electrical Capacity Planning Tool**

Demand on devices grows as organizations expand. While average demand may not be a concern, peak demand is. Foreseer software tracks the kW and kVA over time, immediately informs of peak levels, and projects future demands based on past usage. Assisting in planning for electrical upgrades and/or changes to the power system to support changing load patterns.

## Foreseer Services

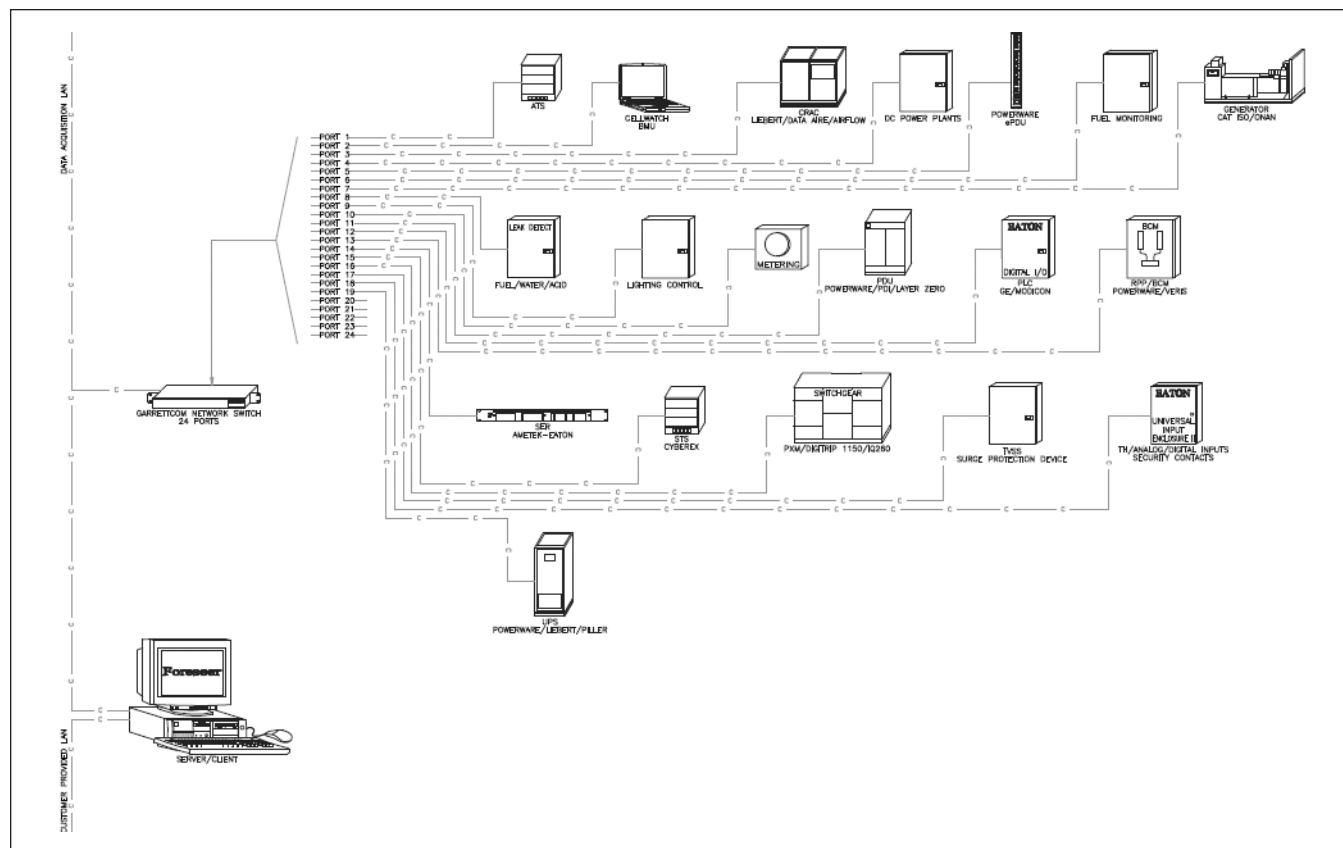
## Load Balancing

**Prevent Unbalanced Loads**

Improper load balancing contributes to harmonic distortion. Foreseer software tracks load levels by phase,

giving instant notification when extreme imbalances begin to occur, and providing the knowledge to take the necessary steps to re-distribute the load. Foreseer software visually illustrates the load balance of a device or

system in real-time, while showing what the balanced model should be. You see the current state, the worst-case scenario and the proper load.



**Figure 2.4-4. Data Center/Co-Location Device**—The typical Data Center/Co-Location device mixture includes a large variety of power distribution, cooling, environmental monitoring, lighting, safety and security, backup and emergency power systems that have been purchased over a long period of time. Foreseer Services integrates all of these systems into a simple, single software monitoring package. Support for metering and energy measurement, including greenhouse gas monitoring, are requirements that need to be taken into consideration as well as, for example, Building Management System integration.



## A/C Control Client Software



AC Control-Zone Assignment

**Take Control of Your Environment**

The Foreseer software A/C interface offers comprehensive monitoring and optional lead/lag control for Air Flow, Data Aire and Liebert System 3 air conditioning units. Lead/lag control and scheduling is viewable via a Web-browser and is controllable with the proper user authority.

**Maintenance Scheduler**

Maintenance Scheduler

**Eliminate the Hassles**

The Foreseer software maintenance scheduler offers the ability to preset scheduled (weekly or periodic) maintenance windows within the system to disarm selected devices on which maintenance will be performed. Disarming the devices allows continued monitoring and archiving during the maintenance period while disabling alarms and preventing unnecessary notification of personnel.

**Foreseer Services  
Available Options****Power Xpert Reporting**

Eaton's Power Xpert Reporting works in conjunction with Foreseer Software allowing a view past individual measurements, trend graphs and events. It consolidates complex data from a multitude of devices from around the globe into easy-to-understand graphical reports. It provides a standard set of reports for the most common report requests. Simply choose from 10 ready-to-go report templates. Power Xpert Reporting can be set to run the report automatically and send you new, updated reports via e-mail at predefined intervals.

**Manager of Managers (MOM)**

Provides a powerful means to integrate data from multiple locations where each location is running its own Foreseer software server. This unique feature provides a scalable system where the total number of integrated points on the centralized MOM server can be as large as 256,000 points.

**Sequence of Events Recorder**

Enables breaker status monitoring capability at a time stamping resolution of 1 millisecond. During a critical or catastrophic event, sequence of event information is captured by the recorder for retrospective analysis and root cause issue mitigation.

**Secure Web Server (https)**

Provides an encrypted means to protect all data that is viewed via a standard Web browser on the Internet or intranet. Using the OpenSSL package from the Internet, Foreseer software is able to provide 128 bit encryption between the Foreseer Software and the Web browser. Both registered certificates from a third-party provider or self-signed certificates are allowed to be used with this option.

**Redundancy**

Safeguards valuable information. The inclusion of one or more extra Foreseer software servers provides the highest levels of system reliability. In the event that one Foreseer software server fails, the remaining servers carry the load of the power monitoring system.

**Data Acquisition Engine (DAE)**

Designed specifically for geographically or physically removed sites where local IT expertise may not exist. The data acquisition engine (see **Page 2.4-24** for details) automatically collects and sends data from critical infrastructure devices, and communicates that data back to the Foreseer software server. Using local processing and the shared bandwidth of an IP network, the DAE reduces the cost required to transmit data to the central server. The DAE also continues to operate independently and generate alarms even if the connection to the central server is unavailable, increasing the overall availability of the management system.

**Data Acquisition Terminal (DAT)**

Easily integrates monitored equipment and sensors located in small, networked remote sites. The DAT (see **Page 2.4-24** for details) employs standard Modbus communications to relay information to either a Foreseer software server or a data acquisition engine over a TCP/IP network. Data is packaged in sequential Modbus registers to enable optimum scan times without impacting network bandwidth.

**Universal Input Enclosure**

Provides network connectivity for analog and contact input information along with device server capability. Each enclosure contains from one to five input modules with pluggable connectors used for power and input wiring, enabling cost-efficient monitoring of equipment in small, remote facilities.

## Foreseer Class Hardware Options

To further expand the reach of Foreseer Services, two hardware devices are offered.

The Foreseer data acquisition engine is designed specifically for geographically or physically removed Foreseer class sites where local IT expertise may not exist.

The Foreseer data acquisition terminal easily integrates monitored equipment and sensors located in small, networked remote sites.

For complete listing of Foreseer class hardware compatibility, visit the Foreseer Web site at [www.eaton.com/foreseer](http://www.eaton.com/foreseer).

### Data Acquisition Engine (DAE)



*Data Acquisition Engine (DAE)*

Designed specifically for geographically or physically removed sites where local IT expertise may not exist. The data acquisition engine automatically collects and sends data from critical infrastructure devices, such as UPS, generator and power distribution units, and communicates that data, as well as status and alarms, back to the centrally located Foreseer server. Using local processing and using the shared bandwidth of an IP network, the DAE reduces the cost required to transmit data to the central server. The DAE can also continue to operate independently and generate alarms even if the connection to the central server is unavailable, increasing the overall availability of the management system.

#### DAE Technical Specifications

- External power input: 115/230 Vac in, 5 Vdc 8A out, optional—48 Vdc
- Ethernet: dual 10/100Base-T Ethernet ports
- Communications ports: four RS-232/422/485 and four USB ports
- Dimensions in inches (H x W x D): 3.50 x 17.00 x 11.00, 19.00-inch rack-mount with removable flanges
- Environment: 32° to 104°F (0° to 40°C), 0% to 90% noncondensing RH
- Monitoring: 3072 channels, maximum of 1536 analog

### Data Acquisition Terminal (DAT)



*Data Acquisition Terminal (DAT)*

Easily integrates monitored equipment and sensors located in small, networked remote sites. The DAT employs standard Modbus communications to relay information to either a Foreseer server or a data acquisition engine over a TCP/IP network. Data is packaged in sequential Modbus registers to enable optimum scan times without impacting network bandwidth.

#### DAT Technical Specifications

- External power input: 100/240 Vac, 47/63 Hz, 1A (0.5A at 240) optional —48 Vdc
- Ethernet: 10Base-T, status and activity LEDs
- Communications: Modbus RTU via UDP using TCP/IP Port 7010 or Modbus TCP
- Dimensions in inches (H x W x D): 1.75 x 19.00 x 4.63
- Weight: 3 lbs
- Environment: -4° to 185°F (-20° to 85°C), 0% to 90% noncondensing RH
- Discrete inputs: 16 channels configure as dry contact
- Relay outputs: 16 channels, SPDT configuration, contacts rated at 500 mA, 125 Vac
- Analog inputs: eight channels of 12-bit A/D up to 16 digital inputs

## Power Xpert Gateway 400E/600E/800E



Power Xpert Gateway

The Power Xpert Gateways 400E, 600E and 800E work on an open communication architecture. They connect both Eaton and third-party electrical equipment communicating through INCOM, QCPort and Modbus RTU.

Modbus TCP/IP supports integration with third-party monitoring solutions. For example, the gateways send information to a Kepware OPC server, which then allows the data from downstream devices to integrate with third-party HMI and Building Management systems.

Ethernet TCP support uses your existing network infrastructure, reducing costs.

For detailed information on the Power Xpert Gateways, please see **Page 2.2-1**.

For detailed information on compatible devices, refer to [www.eaton.com/pxg](http://www.eaton.com/pxg).

## RS-485 PONI

The RS-485 Product Operated Network Interface card, or MPONI card, enables Modbus communication capability to various Eaton products. Each MPONI contains two rotary address switches to uniquely identify each device on the network and a baud rate DIP switch. A 5-pin connector is provided for wiring to the RS-485 network.

Various baud rates are available for networking flexibility, and onboard LEDs indicate operation, error and communication status. The MPONI is applied where a device network exists connected by a dedicated shielded twisted pair conductor. Modbus RS-485 allows a single device or multiple units in a daisy-chain configuration to communicate with another local or remote device and may extend up to 4000 ft (1219m) without a repeater.

The MPONI comes with mounting hardware and attaches to the back of its associated device.

**Note:** Please see IL for detailed register support information for each supported product. Not all device functionality is supported with the RS-485 PONI over the Modbus protocol.

## DPONI

The DeviceNet Product Operated Network Interface (DPONI) enables communication between a DeviceNet network master station and a host device in a master/slave format over a DeviceNet network. The DPONI is compatible with the MP-3000 and

MP-4000. The DPONI is powered both by the host product to which it is attached and by the DeviceNet network.

The DPONI uses opto-couplers to isolate the two power systems. The DPONI communicates at 125, 250 or 500 Kbps selected via a front panel DIP switch. All products on the DeviceNet network must be set at the same communication rate. The DPONI has a bi-color network/module status LED that functions in accordance with the DeviceNet specification. An additional monocolored LED flashes while the DPONI is receiving a message from the host device.

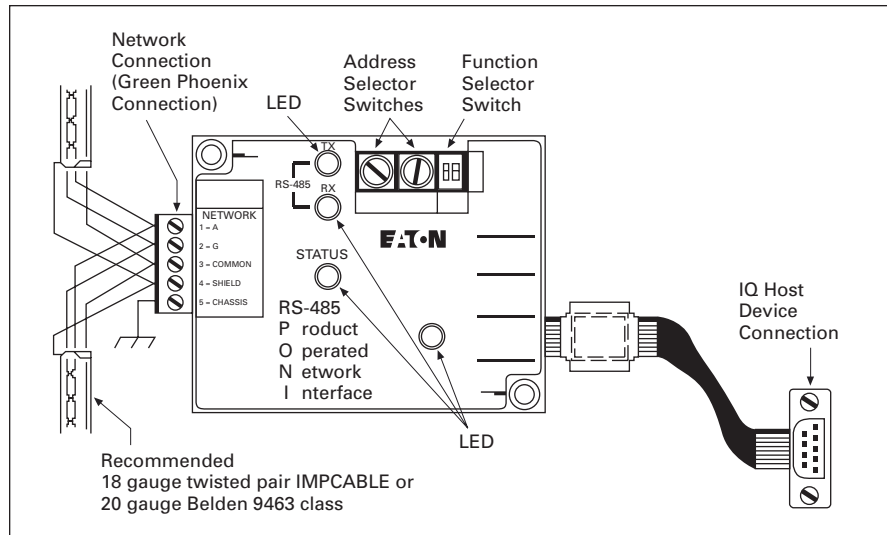


Figure 2.5-1. RS-485 PONI

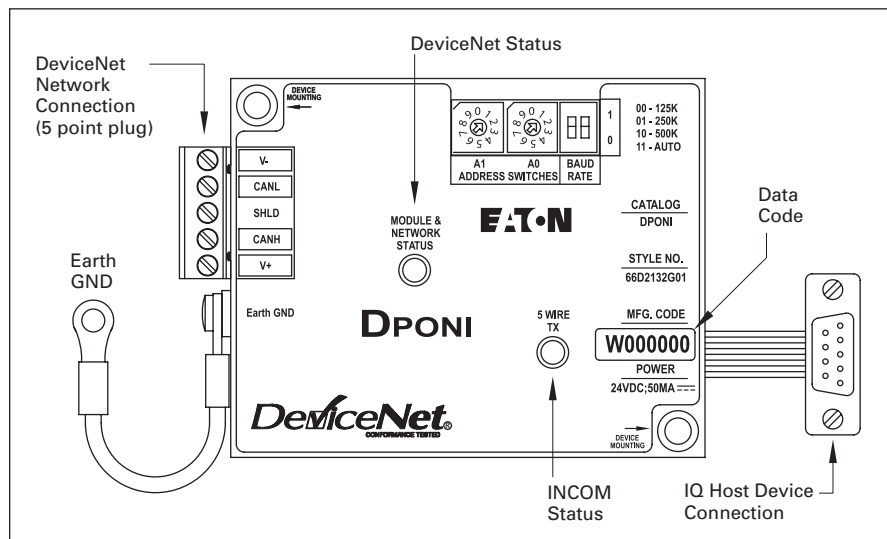


Figure 2.5-2. DPONI

MINTII RS-232 Converter

MINTII RS-232 Converter



MINTII RS-232 Converter

2

General Description

Applications

Converts a network of power management software devices to ASCII RS-232 format for access through a serial port of a PC, laptop, or Programmable Logic Controller (PLC).

Displayed Parameters

- Eaton's MINTII provides access to all parameters monitored over a system monitoring system such as Power Xpert Software or Foreseer Services
- Supports INCOM networks up to 8500 ft (2590m) in distance and device counts up to 1000

Physical Characteristics

- Suitable for panel mounting or desktop use
- 120 Vac power cord included for plug-in to standard duplex receptacle
- Height: 2.25 inches (57.2 mm)
- Width: 11.50 inches (292.1 mm)
- Depth: 4.25 inches (108.0 mm)

Technical Data and Specifications

- Temperature: 0° to 60°C
- Humidity: 0–95%
- Power: 120V
- Speed: 1200, 2400 and 9600 baud (INCOM), 19.2K baud (RS-232)
- Communications: INCOM, RS-232

Product Selection

Table 2.5-9. MINTII RS-232 Converter

Description	Catalog Number
Master INCOM Network Translator II	MINTII

Master INCOM Network Translator II

The Master INCOM Network Translator II (MINTII) converts the twisted shielded pair network of INCOM devices to an RS-232 signal. This signal can be accessed by PLCs, computer serial ports and building management system serial interface cards. The MINTII is also often applied as an interface to standard line drivers and converters to allow communication through dedicated telephone lines, dial-up modems, fiber-optic line drivers, radio frequency or wireless modems.

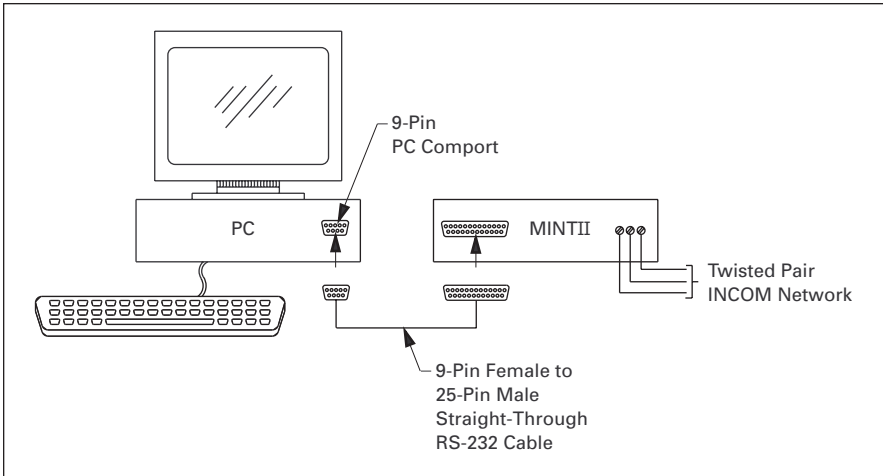


Figure 2.5-3. MINTII Connection Diagram for Use with a PC



## mMINT

## mMINT



mMINT Module

## General Description

The mMINT (Modbus Master INCOM Network Translator) Module is an Eaton accessory product that will provide communication between a Modbus RTU network and an INCOM (INDustrial COMMunications) network (see **Figure 2.5-4**). This module is transparent to the Modbus network. It communicates to a master on the Modbus network using the Modbus RTU (Remote Terminal Unit) protocol. It communicates to slave devices on the INCOM network using the IMPACC (Integrated Monitoring, Protection, and Control Communication) protocol. The catalog number of this product is mMINT.

## Features

The mMINT module is a slave device on the Modbus network and as such requires a master that will exchange register objects with the mMINT module.

- Handles generic pass-through commands (Modbus/INCOM/Modbus)
- Capable of passing Modbus register objects from Eaton's existing products and newer PnP (Plug-'n-Play) products to a Modbus RTU master
- Data in IEEE Floating Point format and fixed point
- Modbus RTU communications data transfer rates of 1200, 9600 or 19200 baud with one start bit, eight data bits, no parity, and either one or two stop bits
- Up to 32 products connected to INCOM network port (246 unique addresses maximum)
- Flashing Status LED to indicate an active module

- LED indicators for INCOM transmit and receive communications exchanges
- LED indicators for Modbus RS-485 transmit and receive communications exchanges
- Input power for the module from either 120 Vac or 24–125 Vdc
- DIN rail mount package
- 0° to 60°C ambient operation

## Module Mounting

When mounting the mMINT, verify that an 11 mm H x 28 mm W DIN rail is used and that it is within an enclosed space.

## Simplified Wiring Rules

## INCOM Network

The following simplified rules apply to a given system consisting of a single daisy-chained main cable link between master and slave devices (see **Figure 2.5-4**). For more complex considerations including star configurations, please refer to the IMPACC wiring specification T.D. 17513.

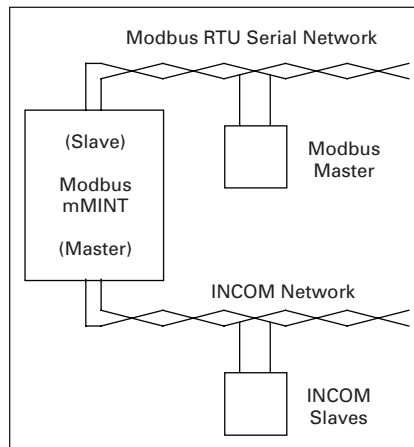


Figure 2.5-4. mMINT in a Communications Network

- Recommended INCOM cable styles are Belden 9463 or C-H style 2A957805G01
- The maximum system capacity is 10,000 feet of communications cable and 32 slave devices on the INCOM network under the mMINT
- Non-terminated taps, up to 200 feet in length, off the main link are permitted, but add to the total cable length
- Make sure that there is twisted-pair wire that is recommended for IMPACC network use. Use shielded twisted-pair wire to connect each slave to the INCOM network, daisy-chain style. The polarity of the twisted pair is not important

## Modbus RS-485 Network

The following simplified rules apply to a given system consisting of a cable link between master and slave devices (see **Figure 2.5-5**). For more complex configurations, please refer to standard Modbus RTU wiring specification rules for the RS-485 network.

- The recommended Modbus cable has twisted-pair wires (24 AWG stranded 7x32 conductors with PVC insulation) having an aluminum/mylar foil shield with drain wire
- The maximum system capacity is 4000 feet of communications cable and 247 devices on the Modbus RTU network
- Make sure that there is twisted-pair wire that is recommended for Modbus RTU network use. Use shielded twisted-pair wire to connect each slave to the Modbus RTU network, daisy-chain style. The polarity of the twisted pair is critically important

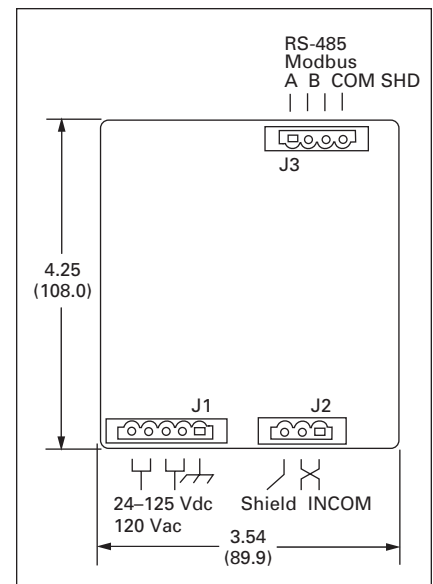


Figure 2.5-5. mMINT Module Dimensions

## Burden

- 24 Vac/dc 3 VA

## Safety Standards

- UL
- CSA
- CE mark

## Communications Speed

- INCOM: 1200, 9600 baud
- N2 Bus: 9600 baud

## PMINR

## PMINT



PMINT Module

## General Description

The PMINT (PROFIBUS DP—Master INCOM network translator) module is an Eaton accessory product that will provide communications between a PROFIBUS DP network master and an INCOM (INDustrial COMMunications) based Digitrip™ Magnum™ 520MC or 1150 trip unit. The module is transparent to the PROFIBUS network master. It communicates to a master on the PROFIBUS network using the PROFIBUS-DP-V0 protocol. It communicates to a slave Magnum trip unit device on INCOM.

## Features

The PMINT module is a slave device on the PROFIBUS network and as such requires a PROFIBUS master that will interrogate the PMINT module.

- The PMINT uses the VPC3+C Profi-Chip integrated circuit, providing PROFIBUS communications support with automatic recognition of data transfer rates up to 12 Mbits/s
- Flashing Status LED to indicate an active module
- LED indicators for PROFIBUS SYSFAULT and BUSFAULT
- LED indicators for INCOM transmit and receive communications exchanges
- Input power for the module from either 100–240 Vac or 24–150 Vdc
- DIN rail mount package
- –40° to 85°C ambient operation

## INCOM Connection

INCOM communications is based on a master-slave protocol. The PMINT is a master on the INCOM connection and continually obtains data from the attached trip unit. Reference material pertaining to INCOM can be obtained from <http://www.eaton.com>, then search on 17384.

- IL17384—Part A: INCOM Communications Standard
- IL17384—Part C: Protective Relays and Trip Units

The following simplified rules apply to a given system consisting of an INCOM master and the slave trip unit.

- Recommended INCOM cable styles are Belden 3073F or Eaton style 2A957805G01
- A 100 ohm terminating resistor is required across the INCOM carrier signal pair at the trip unit
- The maximum system capacity is 8000 feet of communications cable on an INCOM network under the PMINT

Make sure that there is twisted pair wire that is recommended for INCOM network use. Use shielded twisted pair wire to connect between the PMINT and the INCOM communications based trip unit. The polarity of the twisted pair is not important.

## PROFIBUS DP RS-485 Network

Reference material pertaining to PROFIBUS can be obtained from the <http://PROFIBUS.com> Web site. Refer to the PROFIBUS DP standard for transmission using copper cables (RS-485). A 9-pin D-SUB connector interface is provided.